THE IRON TRADE REVIEW

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STEEL

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COKE from KOPPERS by-product ovens is the best coke for metallurgical purposes on account of its uniform size, weight and analysis and its excellent structure.

H. KOPPERS COMPANY

PITTSBURGH, PA.

Builders of By-Product Coke Plants

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THE IRON TRADE REVIEW

Vol. LX Cleveland, May 10, 1917 No. 19

Divide Steel For Most Vigorous War

Mill Output Being Carefully Apportioned to Best Strategical Purposes—Government Direction of Steel Trade is Extending and Tonnage Demands Are Growing—Pig Iron Mounts Steadily

DISTRIBUTION of the gross output of steel for the most effective purposes of war has become the chief problem of the industry. Sober calculation is being given to the systematic apportionment and direction of tonnage for the highest requirements of national service. War utility is the supreme test in this division. With the market so largely sold up, the inevitable readjustments of private trade to the new order of things are extending, but so far have not caused serious disturbance.

The hand and the wishes of the government are figuring everywhere. The extent to which they may be further or finally exercised raises a large question. The plan to construct with all haste large fleets of merchant vessels, both steel and wood, to combat the grave submarine menace, involves sweeping possibilities of government control over the distribution of mill product and over ship yard capacity. The talked-of 6,000,000 addition to shipping tonnage, equally divided between wood and steel, would call for from 1,000,000 to 1,500,000 tons of steel. Standardized construction with the steel mills and fabricating shops filling the most important detail probably will be followed in the building of these boats. The limits of tin plate consumption have been defined. The implement trade has been given increased allotments of material but its claim to a place in the preferred list of manufacturers is undecided.

Direct government buying is being speeded up as plans assume more tangible form. Requirements in structural shapes, plates, sheets and wire products are very large. The automobile trade is about to be called upon for many thousand motor trucks.

Ore Tonnage Far Behind

A belated opening of lake ore traffic, the most delayed in many years, looms up as a new factor in the realm of future raw material supplies with which the present high-geared iron production eventually may be obliged to reckon. It is estimated the season starts 3,000,000 tons behind 1916. Offsetting this handicap is higher stage of water on the lakes and confidence is expressed that with normal conditions, the expected year's movement will be realized. The ore on docks May 1 was heavier than a year ago. Shipments since, as new ore has been held back, have lowered the balance to about last year's figure.

Basic Leads in Iron

Steelmakers are pushing ahead in pig iron buying. Basic tonnage has loomed large in the week's turnover of business. Much of it has been for middle western delivery after Jan. 1. On 5,000 tons for this year's shipment, $2 higher, or $42, valley, has been paid by a southern Ohio buyer. This consumer has been buying a round tonnage. The purchases of a Canton steelmaker are placed at 30,000 to 40,000 tons; a western Pennsylvania works took 4,000 tons; and a Massillon, O., melter is figuring on 5,000 tons. The Bethlehem Steel Co. has been a recent buyer of 10,000 tons of low phosphorus. In other grades, a brisk demand generally for the first quarter and half of 1918 has been maintained, at advancing prices. Foundry iron for this year has become exceedingly scarce.

Sheet bars are making a spectacular price showing. Prompt open-hearth bars have been sold at $100, mill, and a higher price is reported, while a liberal tonnage for third quarter has been done at $95, mill. The Ford Motor Car Co. has bought additional bars to be rolled into sheets under its direction to meet the stringent condition of supply in that finished line.

The general policy to wait for the government to further outline its needs before making additional sales to the general trade continues to be pursued by steelmakers. Throughout the market, new buying either has been actually repressed by these conditions, or hedged about by contingent clauses. Such finished material as is available is bringing higher prices.

THE OPEN HEARTH

Suing Itself Into Trouble

VARIOUS beams of truest light these stirring days have been breaking through the mental fog which has been bewildering the government in the charting of its policies toward business during the past decade or two. The awakening of the government collectively and individually to the true national power and value in an hour of great emergency of large and unified industrial corporations is something akin to a revelation. So complete is the revulsion from finely-spun theories of text book statesmanship to plain every-day intelligence, that in some respects it suggests an appeal to the ludicrous were the hour less grave. The nation is facing a crisis and is calling upon its established commercial strength to the limit of its power, as it should. It is finding that its most dependable and efficient co-operation in war is from its large corporation, because of the centralized forces and resources which they represent.

The unique situation is presented where the government is welcoming its defeat in the anti-trust suit against the Steel Corporation, now in the United States Supreme Court. In the naval appropriation bill, approved Aug. 25, 1916, and providing for an elaborate program of new warship construction, it is specifically provided that none of these funds shall be expended for the purchase of ship material or machinery from persons, firms or corporations who are parties to any existing combination or conspiracy to monopolize the interstate or foreign commerce of the United States. A large portion of the steel required for the naval vessels, in fact, all but a very limited amount, now is being rolled and manufactured for the government in the Steel Corporation mills. If the Supreme Court should uphold the government's contention that the Steel Corporation is a monopoly in restraint of trade, these steel contracts under the terms of the appropriation bill, will be nullified. The confusion and loss to the nation in this hour of trial from such a development can scarcely be magnified.

Truth of the folly of any policy other than permanent cooperation between government and great business enterprises could not be brought home more forcibly than by the present predicament in which the former finds itself at a time when the exercise of fullest economic power is demanded for the public good.

Automobile Sheets

IN 1905 the production of sheets and black plates in the United States amounted to less than 1,500,000 tons. Since that year, the use of sheet material has increased by leaps and bounds, and aside from the natural gains in production to keep pace with the growth of business, the phenomenal rise of the automobile industry has been the most important factor in stimulating the demand for sheets. In 1915, over 3,000,000 tons of sheets and black plates were manufactured, and of this amount it is estimated nearly 600,000 tons were used in the manufacture of automobiles.

These figures indicate that automobile sheets have become an established commodity. This fact is emphasized in the article "How to Specify Automobile Steel", on page 1035 of this issue. The author shows that the manufacturers of motor cars require strip and sheet steel of unusually high quality, and the resources of rolling mill engineers have been taxed to the utmost to provide material which measures up to the requirements. As pointed out by Mr. Guibert, the problem can be simplified by bringing the buyer and seller together under a more intelligent system of co-operation. When both parties to the sale of sheets thoroughly understand the difficulties which confront each other, purchasers' specifications and manufacturers' efforts to meet them will establish an efficient basis of understanding which will materially assist in the development of better grades of automobile steel.

Independents Setting the Pace

INDEPENDENT steelmakers for many months have been taking the lead in advancing prices. They now are selling such products as plates, shapes, bars, sheets, tin plate, wire and tubular goods at $5 to $50 a ton above the prices of subsidiary companies of the Steel Corporation. Although Judge Gary has expressed his opposition to further advances, the upward movement appears not likely to be arrested for an indefinite period. The price situation apparently is getting beyond the control of manufacturers.

For the first time in several decades, independent wire makers have effected an advance, which thus far has not been followed by the leading interest; at least, the latter has made no formal changes in its prices since March 5. At that time quotations were lifted $4 a ton to $3.20 a keg for nails, the historic figure adopted by the John W. Gates interests 17 years ago, in an unsuccessful effort to stimulate activity. On April 17, a Youngstown independent boosted his wire prices $6 a ton, the sharpest advance recorded in the history of the industry in America, to $3.50 for nails. Other independent companies followed suit. Actual sales are being made at the new high levels. Prevailing quotations now are $47 a ton above the lowest price for nails in a period of 20 years.

In the fall of 1912, when the general market was

THE OPEN HEARTH

strong, an independent wire maker boosted quotations $1 a ton, and several other mills adopted the new schedule. The largest maker, however, continued to sell at the old prices, and subsequently manufacturers in general fell back to the quotations previously named by the former. Underlying conditions now apparently have changed.

In the March issue of *The Iron Trade Review* it was pointed out that the historic $3.20 price of nails, which could not be maintained when first quoted in 1900, no longer is regarded as a nemesis to a sound market structure. Present circumstances indicate that no single manufacturer may be looked upon as the Moses of the wire industry so far as prices are concerned, during periods of abnormal demand and prosperity, and that the limits of absorptive power of the market still have not been reached.

Pressure Modifies Practice

PRESENT conditions and abnormal demand for pig iron are developing an interesting change in the relations of the blast furnace toward the foundry. For a decade pressure on the part of furnaces to sell has forced the acceptance by the former of higher silicon specifications until standards have been reached which are comparatively unprofitable to the producers. Making higher silicon iron reduces the tonnage and increases the consumption of coke per ton of iron produced.

The foundryman has become accustomed to receive increased silicon in competition, instead of a concession in price, until this has grown to be almost a settled trade practice. The higher silicon has allowed the use of a greater percentage of scrap in the mixture and has reduced cost of cupola operation to that extent. Hence it has had its advantages for the melter. That production of higher silicon means decreased production and higher consumption of coke by the blast furnaces is not generally appreciated by the industry.

Changed conditions, involving difficulty in obtaining coke and demand for maximum outputs of furnaces, have forced producers to lower silicon specifications. Foundrymen accustomed to the higher silicon content at first objected to the change, but have accepted the conditions with a view to assisting in the production of larger tonnages of iron by the furnaces and thus helping to forestall a threatened shortage of iron. By producing lower silicon irons, the furnaces also are able to spread out their coke supply, effecting economies of no little importance.

These changes in specifications, where they have been adopted, mark an important move of benefit to the furnacemen. When the foundryman has adapted his practice to the new condition, he will have made his contribution toward increasing raw material supplies and toward safeguarding himself against excessive prices or shortages of metal.

After-the-War Prosperity

AS industrial and labor conditions become more and more complex following the declaration of hostilities by the United States, the natural curiosity in regard to the post-bellum prospects becomes more accentuated and increasingly difficult to satisfy. The enormous army and navy programs will tighten the strain on the already overtaxed steel plants. Conscription of men to arms or to farms is certain to reflect its influence upon the labor situation in the industries. However, assuming optimistically that prevailing records of production may be maintained throughout the period of the war, will the domestic and foreign trade of the nation be able to absorb this greatly increased capacity when peace again prevails? To what fields may the steelmaker look for the consumption of this vast tonnage when the demand for shells has ceased?

Certain conditions, prevalent from coast to coast, cast a favorable light toward the future, making it seem plausible that a level will be found which, even if not as high as the present one, will be sufficient to prevent anything like a severe depression. Many commercial expansions planned before the war have been retarded and postponed by the rapidly rising prices of structurals and of labor. Under this category may be included such structures as office buildings, public improvements and buildings for charitable purposes. Many industries so stabilized that the margin of operation does not permit of new construction under conditions now obtaining have also been running with as little expense for expansion as is necessary. During the last two years the railroads have made but few of badly needed extensions to their lines and additions to their equipment. When prices begin to decline, it seems likely that the industries will be called upon to supply materials for this expansion, and the demand for steel will expand as prices approach the normal line. Reconstruction in Europe after the war will be slow according to the minds of the best authorities and the amount of steel needed for this purpose will not be sufficient to utilize the present excess capacity. The hope of the industry after the war is in the future demand for steel for domestic consumption. All indications are that this will be great enough to preclude any recurrence of the serious depressions of 1907 and 1914.

Iron and Steel Prices

Corrected up to Wednesday noon

PIG IRON

(Delivery this year.)

Bessemer valley	$42.00 to 45.00
Bessemer, Pittsburgh	42.95 to 45.95
Basic, Pittsburgh	40.95 to 42.95
Basic, eastern Pa.	41.00
Basic, Buffalo	**39.00 to 40.00**
Malleable, Pittsburgh	42.95 to 43.95
Malleable foundry, Chicago	42.00
Malleable foundry, Philadelphia	43.00 to 44.00
Malleable foundry, Buffalo	**39.00 to 40.00**
No. 1X foundry, Philadelphia	43.50 to 44.00
No. 2 foundry, Pittsburgh	42.95 to 43.95
No. 2 foundry, Cleveland	43.30 to 45.30
No. 2 foundry, Ironton	40.00 to 42.00
No. 2 foundry, Chicago	42.00
No. 2X foundry, Philadelphia	43.00 to 43.50
No. 2X foundry, N. J. tidewater	42.50 to 43.00
No. 2X foundry, Buffalo	**40.00**
No. 2 plain, Philadelphia	42.25 to 42.75
No. 2 plain, N. J. tidewater	42.25 to 42.75
No. 2 plain, Buffalo	**39.00**
No. 2 southern, Birmingham	39.00 to 40.00
No. 2 southern, Cincinnati	41.90 to 42.90
No. 2 southern, Chicago	**38.00 to 40.00**
No. 2 southern, Phila. delivery	40.50 to 41.00
No. 2 southern, Cleveland	42.00 to 43.00
No. 2 south'n, New York docks	40.25 to 41.25
No. 3 southern, Boston docks	40.50 to 41.50
No. 2 south. interior, New Eng.	41.00 to 42.00
No. 2 southern, St. Louis	41.40 to 43.40
Virginia, No. 2X, furnace	40.00
Virginia, No. 2X, Philadelphia	42.75
Virginia, No. 2X, Jersey City	43.00
Virginia, No. 2X, Boston points	43.25
Gray forge, eastern Pa.	38.00 to 38.50
Gray forge, Pittsburgh	40.95
Gray forge, Birmingham	38.00
Silveries, 8 per cent, furnace	**46.00 to 48.00**
Silveries, 8 per cent, Chicago	**50.00 to 51.00**
Low phos. Standard, Phila.	76.00 to 78.00
Low phos. Lebanon, Pa., furnace	70.00 to 80.00
Low phos., Pittsburgh	70.00 to 75.00
Charcoal, Lake Superior, Chgo.	**49.25 to 51.75**
Charcoal, Buffalo	**49.25 to 51.75**
Charcoal, Birmingham	35.00 to 40.00

COKE

(At the ovens.)

Connellsville furnace	$8.25 to 8.50
Connellsville furnace, contract	**8.00**
Connellsville foundry, contract	8.50 to 9.50
Connellsville foundry	**9.50 to 10.00**
Wise county furnace, contract	7.00 to 9.00
Wise county foundry, contract	8.00 to 10.00
Pocahontas furnace, contract	7.00 to 9.00
New River foundry, contract	8.50 to 11.00
New River furnace, contract	7.50 to 10.00

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, delivered prompt	$425 to 475
Ferro manganese, 80 per cent, seaboard and del'd, contract	nominal
Spiegel, 20 per cent furnace remainder of year	75.00 to 80.00
Ferro-silicon, 50 per cent, Pitts., **nominal**	**225**

Bessemer ferro-silicon, 9 per cent, $64; 10 per cent, $65; 11 per cent, $67.50; 12 per cent, $70; 13 per cent, $75 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila	**$70.00 to 80.00**
Forging billets, Philadelphia	100.00
Forging billets, Pbgh.	110 to 115
Forging billets, Chicago	**100.00**
Wire rods, Pittsburgh	85.00 to 95.00
Bessemer billets, Youngstown	80.00 to 85.00
Bessemer billets, Pittsburgh	80.00 to 85.00
Open hearth billets, Pittsburgh	80.00 to 85.00
Open hearth billets, Youngstown	80.00 to 85.00
Bess. sheet bars, Youngstown	90.00 to 95.00
Op. h'th sheet bars, Youngstown	90.00 to 95.00
Bess. sheet bars, Pittsburgh	90.00 to 95.00
Open hearth sheet bars, Pbgh.	90.00 to 95.00
Muck bars, Pittsburgh	70.00

RAILS AND TRACK MATERIAL

Angle bars, Pittsburgh, base	2.75c to 3.25c
Angle bars, Chicago, base	2.75c to 3.00c
Standard bessemer rails, mill	**$38.00**
Standard open hearth rails, mill	**40.00**
Light rails, 8 to 10 lbs., Pitts.	63.00
Light rails, 8 lbs., Chicago	63.00
Light rails, 12 to 14 lbs., Pitts.	62.00
Light rails, 12 lbs., Chicago	62.00
Light rails, 16 to 280 lbs., Pitts.	61.00
Light rails, 16 to 20 lbs., Chgo.	61.00
Light rails, 25 to 45 lbs., Pitts.	60.00
Light rails, 25 to 45 lbs., Chgo.	60.00
Relaying rails, standard, mill	**$38.00 to 40.00**
Relaying rails light, Chicago	**40.00**
Relaying rails, light, St. Louis	48.00 to 51.00
Spikes, railroad, Pittsburgh	3.85c
Spikes, railroad, Chicago	4.00c to 4.15c
Track bolts, Pittsburgh	5.50c to 8.00c
Track bolts, Chicago	5.00c to 5.15c
Tie plates, Chicago	**$60.00 to 65.00**

SHAPES, PLATES AND BARS

Structural shapes, con. Pitts.	4.00c
Structural shapes, Philadelphia	4.159c to 4.659c
Structural shapes, New York	4.169c to 4.669c
Structural shapes, Chicago	4.19c to 5.00c
Tank plates, Chicago	4.69c to 7.00c
Tank plates, Pittsburgh (con.)	**4.50c to 4.75c**
Tank plates, Pittsburgh	5.50c to 7.00c
Tank plates, Philadelphia	5.159c to 7.159c
Tank plates, New York	5.169c to 7.169c
Bars, soft steel, Chicago	3.69c to 4.00c
Bars, soft steel, Pittsburgh	3.50c
Bars, soft steel, New York	3.919c to 4.169c
Bars, soft steel, Philadelphia	3.909c to 4.159c
Hoops, Pittsburgh	**4.25c to 4.50c**
Bands, Pittsburgh	**4.10c to 4.35c**
Bands, Pittsburgh (contr.)	3.50c to 4.00c
Shafting, Pittsburgh carloads	10 to 5 off
Bar iron, Chicago	3.25c to 3.50c
Bar iron, Philadelphia	4.159c
Bar iron, Cleveland	**3.50c**
Bar iron, New York	4.169c
Bar iron, Pittsburgh	**3.75c**
Hard steel bars, Chicago	**3.50c**
Cut nails, Pittsburgh	3.70c

SHEETS

(In cents per pound.)

(Open hearth 25c above bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	6.30 to 7.30
22 to 24	6.35 to 7.35
25 and 26	6.40 to 7.40
27	6.45 to 7.45
28	6.50 to 7.50
29	6.55 to 7.55
30	6.65 to 7.65

TIN MILL BLACK.

Gage.	Bessemer.
15 and 16	6.20 to 7.20
17 to 21	6.35 to 7.35
22 to 24	6.40 to 7.40
25 to 27	6.45 to 7.45
28	6.50 to 7.50
29	6.55 to 7.55
30	6.60 to 7.60

GALVANIZED.

Gage.	Bessemer.
10 and 11	7.50 to 8.50
12 to 14	7.60 to 8.60
15 and 16	7.75 to 8.75
17 to 21	7.90 to 8.90
22 to 24	8.05 to 9.05
25 and 26	8.20 to 9.20
27	8.35 to 9.35
28	8.50 to 9.50
29	8.75 to 9.75
30	9.00 to 10.00

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	6.50 to 7.50
9 to 10	6.50 to 7.50
11 to 12	6.50 to 7.50
13 and 14	6.50 to 7.50
15 and 16	6.50 to 7.50

No. 28 black, Chicago	6.69c to 7.19c
No. 28 galvanized, Chicago	8.69c to 9.19c
No. 10 blue annealed, Phila.	6.659c
No. 10 blue annealed, Chicago	6.69c to 7.19c

TIN PLATE

Tin plate, 100 lb., coke base, contract	7.50c to 10.50c
Tin plate, coke base, prompt	8.50c to 11.50c
Terne plate, I. C.	7.15c to 8.00c
Terne plate long	8.00c

WIRE PRODUCTS

(Retailers 5 cents above jobbers.)

Wire nails, jobbers', Pittsburgh	$3.50
Coated nails, Pittsburgh	3.40
Plain wire jobbers', Pittsburgh	3.45
Galvanized wire, jobbers', Pitts.	4.15
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted jobbers', Pitts.	3.65
Barb wire, galv., jobbers', Pitts.	4.35

IRON AND STEEL PIPE

(Price adopted May 1, 1917.)

Steel.

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
⅛, ¼ and ⅜, butt	42	15½
½, butt	46	31½
¾ to 3, butt	49	35½
2, lap	42	29½
2½ to 6, lap	45	32½
7 to 12, lap	42	28½
13 and 14, lap	32½	....
15, lap	30	....

Iron.

(Prices adopted May 1, 1917.)

Standard weight, threads and couplings, diam. in inches.	Black. Per cent off.	Galv. Per cent off.
⅛ and ¼, butt	30	3
⅜, butt	31	4
½, butt	35	17
¾ to 1½, butt	38	22
1¼, lap	23	8
1½, lap	30	16
2, lap	31	17
2½ to 6, lap	33	20
7 to 12, lap	32	19

BOILER TUBES

(Price adopted April 2, 1917.)

Steel, 3½ to 4½ inches, l. c. l.	**34**
Iron, 3½ to 4½ inches, l. c. l.	**16**

RIVETS

Structural rivets, Pittsburgh	4.75c
Boiler rivets, Pittsburgh	4.85c
Tinner's rivets, 40 and 10 off, Pittsburgh.	

STEEL SHEET PILING

Base sizes, Pittsburgh 3.50c to 4.00c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil 7.00c

COLD ROLLED STRIP STEEL

Base price, 7.00c to 8.00c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$58.50
Six-inch and larger, Chicago	55.50
Six-inch Class B, New York	55.50
Four-inch class B, New York	58.50
Four to six-inch, Birmingham	48.00 to 50.00
Six-inch and larger, Birmingham	44.00 to 46.00

Light weight water and gas pipe $1 per ton higher than standard water.

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts ⅜ x 6 inches, smaller or shorter, rolled thread, 40; cut threads, 35 and 2½, larger or longer, 25.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter rolled 40 and 10; cut, 40; larger or longer, 30.

Cold pressed, semi-finished hexagon nuts, 50 and 10.

Gimlet and cone point lag bolts, 45. Hot pressed square nuts, blanks, $2.10 off; tapped $1.90 off. Hot pressed hexagon nuts, blank, $1.60 off; tapped, $1.40 off.

Cold pressed square nuts, blank, $1.70 off; tapped, $1.50 off. Cold pressed hexagon nut, **blank, $1.60 off; tapped, $1.40 off.**

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products May 9, average for April, 1917, average for February, 1917, and average for May, 1916. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices May 9, 1917.	Average prices April, 1917.	Feb., 1917.	May, 1916.
Bessemer pig iron, Pittsburgh..	$44.95	$42.20	$35.95	$21.95
Basic pig iron, Pittsburgh.....	41.95	39.20	30.95	18.95
No. 2 Fdy. pig iron, Pittsburgh	42.95	39.95	33.95	19.45
No. 2, Fdy. pig iron, Chicago..	42.00	39.25	31.25	19.00
Lake Superior Charcoal, Chicago	49.25	42.25	34.50	19.75
Malleable, Chicago	42.00	39.00	31.25	19.50
Southern No. 2, Birmingham...	39.00	35.79	24.50	15.00
Southern Ohio No. 2, Ironton.	40.00	38.60	33.00	18.50
Basic, eastern Pa.....	40.00	38.25	30.50	20.00
No. 2X Virginia, furnace.....	40.00	38.25	29.00	18.00
No. 2X foundry, Philadelphia...	42.75	41.50	32.00	20.50
Ferro mang., delivered.....	425.00	360.00	265.00	175.00
Bessemer billets, Pittsburgh....	85.00	72.50	62.50	41.20
Bessemer sheet bars, Pittsburgh	85.00	72.50	62.50	41.20
Open hearth sheet bars, Pitts...	92.50	72.50	62.50	41.20
Open hearth billets, Pittsburgh.	92.50	72.50	62.50	41.20
Steel bars, Pittsburgh.....	3.50	3.387	3.00	2.50
Steel bars, Chicago.....	3.69	3.54	3.14	2.69
Iron bars, Philadelphia.....	4.159	3.659	3.259	2.559
Iron bars, Cleveland, local del'y.	3.50	3.25	3.00	2.40
Iron bars, Chicago mill.....	$3.25	$3.19	$3.00	$2.35
Beams, Chicago	4.19	3.79	3.38	2.69
Beams, Pittsburgh	4.00	3.70	3.25	2.50
Beams, Philadelphia	4.659	4.159	3.509	2.659
Tank plates, Pittsburgh.....	4.50	4.50	3.75	2.75
Tank plates, Chicago.....	4.69	4.69	3.94	3.09
Tank plates, Philadelphia.....	7.159	6.909	5.009	3.909
Sheets, blk., No. 28, Pittsburgh	6.75	5.75	4.56	2.92
Sheets, blue anld., No. 10, Pitts.	6.50	5.37	4.37	3.02
Sheets, galv., No. 28, Pittsburgh	8.50	7.56	6.50	4.88
Wire nails, Pittsburgh.....	3.50	3.20	3.00	2.50
Connellsville fur. coke, contr...	8.00	7.25	8.00	2.60
Connellsville fdy. coke, contr...	8.50	7.87	6.50	3.50
Heavy melting steel, Pittsburgh	27.50	28.12	21.87	17.12
Heavy melting steel, eastern Pa.	26.00	25.15	20.50	16.75
Heavy melting steel, Chicago...	27.50	26.65	21.65	16.50
No. 1 wrought eastern Pa.....	40.00	38.50	27.00	22.50
No. 1 wrought, Chicago.....	31.00	29.80	24.00	16.35
Rerolling rails, Chicago.....	35.00	31.88	25.63	17.25
Car wheels, Chicago.....	24.50	23.25	18.30	13.13

*Seaboard.

(For Additional Prices See Page 1058.)

Basic Iron Jumps Ahead $2 Per Ton

Good Tonnage Sold at $42, Valley, For This Year—Canton Buyer Closes For 30,000 to 40,000 Tons and Other Sales Made—1917 Supplies Scarce and Higher Prices Generally Prevail

Pittsburgh, May 8.—Pig iron prices rapidly are approaching the $50 mark. Steelmaking and foundry grades, for the first time in many years, are selling at about the same price. Basic has made a clean-cut advance of $2 a ton and bessemer has worked its way toward $44. The Columbus Iron & Steel Co., Columbus, O., which entered the market a few days ago for 10,000 to 20,000 tons of basic for last half, has closed for a large portion of this iron on the basis of $42, valley. The United Alloys Steel Corporation, Canton, O., is credited with having taken 30,000 to 40,000 tons of the same grade at about $40, valley, for delivery the fourth quarter of this and the first quarter of next year. A western Pennsylvania steel works has bought 4,000 tons of prompt basic at $40, valley. The Central Steel Co., Massillon, O., is negotiating for 5,000 tons of basic for shipment the last three months of 1917. A 3,000-ton lot of bessemer is reported to have commanded $44, valley. That figure, many dealers say, represents the bottom of the market. Shipments of bessemer iron abroad have been resumed. An eastern Ohio blast furnace is filling an order for 30,000 tons of this grade for export to Italy. Scattering lots of bessemer have been sold in the last week or 10 days at $42 to $43, valley. Dealers generally are asking $45. Foundry and malleable grades reflect strength. Most dealers are asking $43, valley, and some are quoting $45. A local railway equipment manufacturer has bought about 5,000 tons of malleable at the going price. A sale of 1,000 tons of lake malleable for this year was done at $42, furnace, or slightly below $43.50, delivered this territory.

Southern Iron Active

Philadelphia, May 7.—Buying of its last half foundry requirements by the Baldwin Locomotive Works is the principal business of the week in the pig iron market in this district. This interest placed 2,000 tons of No. 2X wth a Lebanon valley maker, 3,000 tons of No. 2X with a New Jersey furnace and it is understood 3,000 tons of low silicon went to a tidewater furnace. The prices on this and other business indicate that No. 2X for this year is from $42.50 to $43.50, Philadelphia. Other sales include 3,000 tons of foundry, last half, to a Phillipsburg, N. J., buyer by a Lehigh valley furnace, and, within the past two weeks, 10,000 tons of stand-

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ard low phosphorus for this year and early next to the Bethlehem Steel Co. A large eastern steelmaker now is inquiring for 7,500 tons of standard basic for the next three months and 1,000 tons of spot low phosphorus basic. Basic is at $41, eastern Pennsylvania furnace minimum. Considerable activity again has characterized southern iron. Sales of several thousand tons of No. 2 for third quarter have been done at $35 and $35.50, Birmingham. The latter figure now is minimum and $36 is asked. Prices on smaller lots of northern iron show considerable variation. A Lebanon valley interest sold 500 tons of No. 2X spot at $44, furnace, and later a smaller tonnage at $44.50. The lowest prices quoted this week by eastern makers are $42, furnace, for No. 2X and $41.75 for No. 2 plain. Further first half business is being taken by a central Pennsylvania interest at $36, furnace, for No. 2X. The leading Virginia maker continues out of the market. Another Virginia interest quoting $40, furnace, minimum for this year, has opened its books for first half at $38, furnace, for the six months and $40 for the first quarter alone. Another Virginia maker which has not yet sold beyond third quarter has only high silicon left, and asks $45, furnace, minimum, on this. Central Iron & Steel Co., Harrisburg, Pa., has blown in a furnace after a protracted idleness.

Active Buying Maintained

New York, May 8.—Calm but active buying both of large and small tonnages and a continued upward price tendency still dominates the pig iron market here. The International Harvester Co. has placed 3,000 to 4,000 tons of malleable for last half for Auburn, N. Y., and its Canadian plant; the American Locomotive Co., 900 tons, mostly foundry, but including some high manganese, for its Richmond, Va., plant, for last half; and a New Jersey consumer bought 900 tons of No. 1 for first half. A New York state agricultural implement maker has closed with a central Pennsylvania furnace for 1,000 tons of foundry for first half. Inquiry for malleable continues brisk and includes tonnages for Buffalo, Rochester, Elmira and Syracuse, N. Y. The American Locomotive Co. has withdrawn its inquiry for the last half requirements of its Dunkirk, N. Y., plant. The American Brake Shoe & Foundry Co. wants 500 tons of foundry for its Baltimore plant, and the New York Central railroad, 500 tons of foundry for its Frankfort, N. Y., shops. The government is inquiring for 400 tons of foundry for Washington; 500 tons of low phosphorus for Brooklyn and tonnages of foundry for Puget Sound and Portsmouth. A New Jersey consumer is out for 1,000 tons of foundry for first half. The United States Cast Iron Pipe & Foundry Co. asks 5,000 tons of No. 2 foundry for last half delivery to its Burlington, N. J., plant. Prices show an upward tendency. While basic still may be quoted at $40 to $40.50, eastern Pennsylvania furnace, the minimum for foundry now appears to be $42, eastern Pennsylvania and New Jersey furnaces, for No. 2X for this year. On first half, $38 to $39, eastern furnace, now represents the market. At the same time, sales of small tonnages at $43 and $44 and even $45, eastern furnace, for this year, and $40 for next year are being done. The only sales of Buffalo iron in this territory involve small tonnages at $45, furnace, for this year, and $40 for next. One Buffalo maker also is holding basic at these levels. A western New York interest, which a week or two ago was selling first half iron at $36, furnace, has declined further business at this price, and is quoting higher, having sold for next year up to $41, furnace.

Buffalo Prices Go Up

Buffalo, May 8.—Furnaces of the Buffalo district are practically sold up tight over the year and have stiffened asking prices to $45 to $47 for such delivery. The minimum on No. 2X is now $45.50 while the lower grades are being quoted at $45. Malleable is being held here at the price asked for better grades of pig iron, namely $45.50 and the nominal price on what charcoal iron is available is $50 to $51. The producers are assuming a more conservative attitude towards inquiries for 1918 and are refraining from booking such business. There is also a disposition on the part of consumers to hold off on such advance commitments. A large portion of the melters usually supplied by the stacks of the district have so far made no endeavor to come forward with their 1918 needs. A sale of 1,000 tons of malleable for the first half of next year was closed at $42, furnace. A 1,500-ton foundry lot for next year went at $41, furnace, in the Buffalo district.

Basic Sales Heavy

Cleveland, May 8.—Basic has been selling freely during the past few days. A Canton, O., steelmaker has closed for 30,000 to 40,000 tons for last quarter and first quarter, and is believed to have paid $40, furnace. A southwestern Ohio steelmaker bought 5,000 tons for last half delivery at $42, valley furnace. The same buyer is said to have taken 15,000 tons additional from southern Ohio furnaces. Another inquiry for 10,000 to 20,000 tons of basic for last half has been current. Malleable is strong, two sales of 1,000 tons each for last quarter bringing $42, furnace. One seller now is quoting $43. An inquiry for more than 5,000 tons of malleable is pending.

Supplies of iron for this year's delivery have become scarce and buyers are obliged to cast about widely to get early metal. One buyer of foundry had difficulty in locating anything under $45, Cleveland, and then developed only a small tonnage. A small sale of No. 2 foundry for down state shipment was closed at $44.45, delivered, or $43.50, valley. Sales also were closed at $43, valley, or $43.95, Cleveland basis. Small sales of Alabama No. 2 for this year have been made in this territory at $40, Birmingham, or $44, delivered. Northern low silicon for this year has brought $42, furnace. For next year $40, furnace for No. 2 foundry is minimum, with sales at higher levels. The week's buying in this territory has been largely miscellaneous and in small lots because of the difficulty in getting iron.

Chicago Iron Advances

Chicago, May 9.—Northern malleable and foundry pig iron have been advanced from $38 to $40, furnace, for first half of 1918. Should pending options be closed the quotation will be advanced at once, as remaining production for that period is extremely small. It is estimated that furnaces in this district have less than 20 per cent of their first half production unsold. For last half of this year the price remains at $42, furnace, with small inquiry and little iron available. At least two important southern producers have opened books for 1918, one being willing to sell for first half and the other for first quarter. In each instance agents are required to submit propositions before closing. Selling prices range from $35 to $36, Birmingham. For prompt southern iron, some of which is being received on consignment, $38, Birmingham, is being done readily. Since makers have decided to restrict silicon in their furnace output as a matter of economy in coke and for larger production, foundrymen have been seeking silveries to make up for the lack. Considerable sales of this iron have been made recently. One interest in the south is quoting $49.75, delivered Chicago, for prompt 8 per cent, with $1 less for 7 per cent

(*For miscellaneous prices see page* 1058.)

and $2 less for 6 per cent. It is believed no maker of silveries is now taking contracts for last half shipment. Jackson county makers are quoting $52 to $55, furnace, on 8 per cent silicon for first half. Lake Superior charcoal iron is unchanged at $49.25 to $51.75, with comparatively light business.

Pig Iron Slower

Cincinnati, May 8.—The pig iron market has slowed up a little since last week. This is due principally to the fact that the majority of furnaces in both the south and southern Ohio are out of the market and are not soliciting business. Inquiries are limited to one lot of 500 tons of foundry iron for the last half from a northern Ohio stovemaker, and another of the same tonnage of foundry from Lansing, Mich., for first half. Prices continue to stiffen. Southern No. 2 foundry for prompt delivery is held from $39 to $40, Birmingham basic, and from $36 to $40 for the first half. The majority of stacks are asking nearer $40 than $36. Southern Ohio No. 2 foundry is now from $40 to $42, Ironton basis, for any delivery up until July, 1918. Southern Ohio silvery iron has advanced to $50, furnace, for 8 per cent silicon for 1917 and the first half of 1918.

Foundries Face Famine

St. Louis, May 5.—Great scarcity and stiff prices continue the salient features in the pig iron market here. Dealers are experiencing marked difficulties in supplying customers, and frankly declare they are about at the end of their resources. Consumers are all running at capacity and melting heavy tonnages, which, however, have been fairly well covered by contract. New business is being refused because of uncertainty as to ability to get pig iron to fill the orders. No. 2 southern pig iron is quoted at from $38 to $40, Birmingham, but nothing for spot delivery can be touched under $40. Dealers are predicting $50 by the end of July.

Railroads Cause Complaint

Birmingham, May 8.—A few sales of pig iron are being made in the Birmingham district and it is apparent there is not a large amount of unsold product left for the last half. Railroad deliveries are so poor that a committee of the coal, coke and iron and steel producers in this section will call upon presidents of the roads and urge quick relief. Iron has been piling up at the furnaces and many coal mines are losing time. Quotations above $40 per ton for No. 2 are reported. A foreign order at $42 has been mentioned. Those companies able to take on a little business are quoting $36 for No. 2 for first half of next year. Special grades and analysis iron in small lots have been sold again at $38. The bulk of the inquiries is being answered by the statement that but little can be done for delivery this year. Business booked for the first half of 1918 is beginning to aggregate considerably. Make of iron in the Birmingham district has been increased by the resumption of the Sloss-Sheffield Steel & Iron Co.'s city furnace and the blowing in of the little Eagle furnace at Attalla. Repair work on three other furnaces in this section is to be rushed. The Shelby Iron Co. will get its No. 2 furnace at Shelby in operation about the middle of June. The Trussville and Talladega furnaces will not be ready before August.

Government Wants Alloy

Inquiries For Tonnage 85 Per Cent Ferro Silicon
Ferro Manganese Up to $500

New York, May 8.—An inquiry for 2,400 tons of 85 per cent ferro-silicon has been put out by the navy department. Since ferro-silicon of any analysis is very scarce at present and as 85 per cent metal now is not figuring in the market so far as known, it is likely that these requirements will have to be especially made for the government. The ferro-silicon market is quiet although a large amount of this metal could be sold if it were available. There are numerous inquiries for contract as well as spot shipment. Fifty per cent ferro-silicon is quoted nominally at $250 for June and July shipment, at which the last sales were made. Some metal is available for the fourth quarter, but no price is named for this.

Spiegeleisen has produced the biggest business in ferro-alloys this week. Contracts for several thousand tons have been sold for forward delivery at higher than $75, furnace. The market is firm from $75 to $80 for the remainder of the year. Some small contract business, involving shipment late this year, has been booked at between $85 and $90, furnace. Inquiry continues good.

Numerous small sales of ferro-manganese have been made during the week. Fully 100 tons of British ferro-manganese for spot delivery were sold at $400. One seller at this price now is out of the market while another has advanced to $450. So far as known, $400 no longer can be done on spot. Several sales of future domestic ferro-manganese have been made involving several hundred tons of last half, some at $400, and some around $425, delivered. The British ferro-manganese reported last week as offered for fourth quarter has not been sold because definite instructions have not yet been received from the British authorities as to what class of consumers may have this metal.

Since prices were advanced on ferro-tungsten a little more than a week ago, this metal has been quiet. Some export business has been done at $2 to $2.05, furnace, for 70 to 80 per cent. On domestic business, the market is unchanged at $2 to $2.15, both for ferro-tungsten and tungsten powder. Demand for ferro-chromium continues active but not much business is reported. Quotations on 60 to 70 per cent ferro-chromium containing 4 to 6 per cent carbon, range between 18c and 22c at the furnace.

Cuban Mining Restored

Philadelphia, May 7.—The production of manganese ore in Cuba now is being maintained under better conditions, at least one of the important mining companies having obtained a sufficient number of government troops to protect its operation.

Ferro Brings $500

Pittsburgh, May 8.—War-time prices are being paid for ferro-manganese. One lot, involving slightly less than a carload, a few days ago commanded $500, delivered. Several carload sales have been made at $475, delivered. Little metal is available for nearby delivery and quotations for contract shipment necessarily are regarded as nominal. Lower grades of bessemer ferro-silicon have been boosted $5 a ton to $67.50, furnace for 11 per cent. Some material has been sold on that basis. Most manufacturers have withdrawn from the market for delivery before the fourth quarter. The government is in the market for the annual requirements of bessemer ferro-silicon for the navy department, 2,400 tons. Spiegeleisen now is held at $80, furnace, by several dealers. Specifications for this alloy are heavy, but not much new buying is reported.

Chicago Ferro Unchanged

Chicago, May 9.—Ferro-manganese from the Chicago stack is unchanged at $425, furnace, for prompt delivery and $400 for last half. The prompt price includes all deliveries to July 1.

(*For miscellaneous prices see page* 1058.)

Sheet Bars Jump to $100

Good Tonnage For Quick Shipment Brings That Figure —Third Quarter Steel Sells at $95, Mill

Cleveland, May 8.—Sheet bars continue their spectacular advance. A local maker this week sold 2,000 tons of open hearth bars for shipment by July at $100, mill, and also 12,000 to 13,000 tons for third quarter at $95, mill. One buyer closed for about 10,000 tons. As reported, the Ford Motor Co. has been an additional buyer of bars to be rolled into automobile sheets in designated mills. An offer of $85, Pittsburgh, for 1,000 tons of open hearth bars was declined. Several thousand tons of bessemer bars were sold in the week at $82.50, Pittsburgh. Billets continue scarce and one maker in this territory asked $90 mill minimum. Corrigan, McKinney & Co. are starting one unit of a new group of four open hearth furnaces. With this capacity in operation, this company will have 16 furnaces.

Remelts Own Discards

Youngstown, May 8.—One leading maker of semi-finished material in this district has ceased to sell his shell discards and, in view of the high and rising price of pig iron, considers it better economy to remelt them for his own purposes. Definite assertion is made by the only sheet bar maker in this territory, now in the market, that it will not sell any bessemer bars for third quarter delivery for less than $85. This company has sold almost all of its third quarter output at from $80 to $82.50. It is not offering for last quarter of this year or for any delivery next year. This maker is holding to open-hearth sheet bars, and declares he can get as high as $105 to $110 for spot delivery. Some government orders are coming into the valley, but the official war allotment is not expected for some days. Transportation conditions among the manufacturers of semi-finished are worse this week than they have been for some time.

Cold Rolled Hits 7.50c

Pittsburgh, May 8.—Cold rolled strip steel now is selling at 7.50c to 8c for future delivery. Not much tonnage is being offered for shipment before the fourth quarter.

Sheet Bars at Century Mark

Pittsburgh, May 8.—Prognosticators who have talked about $100 sheet bars since the outbreak of the war in Europe have seen their predictions fulfilled. Ordinary soft steel sheet bars have been sold at about $100 a ton and reports frequently are heard of a sale at $105, mill. Various lots of 1,000 tons each have been sold at $95, mill. A price of $90, mill seems to represent the minimum. The Ford Motor Car Co. is reported to have paid $90 for 2,000 tons of sheet bars to supplement previous purchases at a slightly lower figure. This tonnage will be shipped to a Mahoning valley mill for rolling into automobile stock. Billets are about equally as strong as sheet bars. Forging billets are selling at 5c a pound and slightly above.

Eastern finishing mills are negotiating for heavy tonnages of slab ingots. Muck bar has been advanced $10 to $70, Pittsburgh. Wire rods, which are scarce, are held at as high as $90. A fairly heavy demand exists for wire rods for foreign shipment.

Allies Want Shell Steel

Inquire at Pittsburgh For 154,000 Tons For Next Year's Delivery—Implement Makers Specify Briskly

Pittsburgh, May 8.—Our European allies are figuring in this market for heavy tonnages of shell steel for prompt and future shipment. One inquiry calls for 100,000 tons and another for 54,000 tons for shipment probably to France and England. The Erie Forge Co., Erie, Pa., is equipping shops for manufacturing shells for the United States government. It is not known, however, whether necessary steel has been purchased in connection with this order.

Agricultural implement manufacturers, apprehensive about supplies, are specifying briskly for bars, small angles and channels, and many of them are endeavoring to purchase additional tonnages to meet demands for farm machinery. Steel bars are listed at 3.50c for shipment at the convenience of the mill. Bar iron is quoted at 3.75c.

Rerolled Bars Easy

Cleveland, May 8.—In sharp contrast to the unusually strong conditions in other finished lines, reinforcing steel bars rerolled from hard stock show price irregularity. Quotations are from 3c to 3.25c, mill. Very quick shipments can be made on moderate lots. The listless condition of the market is attributed to the limited amount of new construction work. A good many bars also are being rerolled from comparatively low-priced shell crops and discards.

Western Market is Dull

Chicago, May 8.—With most makers discouraging further buying and regular customers fairly covered for 1917 requirements, the volume of inquiry for steel bars is materially less. Other consumers who have less claim on mills continue to inquire, but the attitude of most sellers is sufficiently well known to make these offers less insistent than formerly. The lowest prices at which any business apparently can be placed is 3.69c, Chicago, and it is doubtful if much tonnage would be taken by any maker at that figure. All kinds of premiums are obtainable, but even at the high prices mill capacity is limited.

Hard Steel Holds Position

Chicago, May 8.—Hard steel bars continue to be quoted at 3.50c, Chicago mill, with demand increasing, as reinforced concrete work is coming out under better weather conditions. While most makers are not sold far ahead, at least one mill is not anxious to take further tonnage, and is questioning the wisdom of additional selling for the future under the circumstances. The supply of rails for rerolling is limited, and the cost is unusually high.

Iron Bars Replace Steel

Chicago, May 8.—While no special change has taken place in the situation on bar iron, higher prices have been obtained on tonnages sold to users outside this immediate territory. A price of 3.25c, Chicago mill, is being done by regular customers, with attractive specifications. The bulk of current business, however, is at 3.35c, and for iron going into eastern territory or export, 3.50c to 3.60c is being obtained. Inquiry is being received from a much wider area than usual. Consumers in the east unable to place their requirements with home mills are seeking other sources of supply. Many users of soft and hard steel bars, unable to fill their requirements, are adopting bar iron as a substitute.

Nut-Bolt Advance Likely

Pittsburgh, May 8.—Nut, bolt and rivet manufacturers likely will put up quota-

(*For miscellaneous prices see page* 1058.)

tions at an early date, in consonance with recent advances in the price of bar steel. Demand is described as heavy, particularly for delivery to ship builders in this and foreign countries. Premium prices continue to be offered for prompt ship rivets.

Chain Still 7c

Pittsburgh, May 8.—Three-eighths inch proof coil chain continues to be listed at 7c, but an advance appears to be imminent. Heavy tonnages are being forwarded to ship yards along the eastern seaboard.

Shafting Price Hardens

Pittsburgh, May 8.—Most manufacturers now are asking 10 per cent off the list and above for cold rolled steel shafting, but the 15 per cent off the list price has not disappeared. Fuse makers continue to buy rather heavy tonnages.

Ferro Falls Off

In Rate of Shipments From England —Manganese Ore Active

Imports of English ferro-manganese have been tapering off according to the government figures of foreign commerce for the month of March and for the nine months of the fiscal year ended with March. The March figures were 5,324 tons against an average of 6,784 tons monthly for the preceding nine months. The receipts of manganese ore which originate largely in Brazil are maintaining a heavy total, reflecting the activity in the production of ferro-manganese and spiegeleisen by domestic furnaces. Nickel makes a good showing in the quantity received, and a fair amount is being exported. Some ferro-tungsten now is being exported.

Imports of ferro-manganese, ferro-silicon, manganese ore and various steelmaking ores and alloys, in gross tons, are as follows:

	March,		Nine months ending March,	
	1917.	1916.	1917.	1916.
Ferro-manganese.	5,324	.....	61,059	.....
Ferro-silicon ..	977	716	5,624	3,762
Manganese ore.	56,394	26,212	485,018	307,382
Tungsten bearing ore	269	.....	2,952	.....
Nickel, nickel oxide and matte	3,564	3,389	24,942	22,974

Exports of various ferro-alloys and metals, in gross tons, are as follows:

	March,		Nine months end'g March,	
	1917.	1916.	1917.	1916.
Ferro-tungsten & tungsten metal	71	.....	437	.....
Ferro-vanadium.	160	62	912	321
Nickel, nickel oxide and matte	1,107	1,188	11,205	7,404

The Firth-Sterling Steel Co. has purchased a tract of 46 acres of land near Ambridge, Pa. No official announcement has been made as to the use to which the property will be put.

U-Boats Sink Much Steel

Loss From Vessels Sunk Past Two Weeks Estimated at 200,000 Tons—Government Allots Orders

Pittsburgh, May 8.—Undersea craft of the central powers are wiping out tremendous tonnages of steel and one authority in close touch with the situation estimates almost 200,000 tons have been lost during the past fortnight. Several manufacturers are asking 7c for ordinary plates, and others are quoting 7.50c for ship plates. Foreign interests are negotiating for 6,000 tons of ship plates for early delivery. Builders of heavy rolling mill equipment are receiving requests from all parts of the country for plate mills; these inquiries, however, cannot be seriously considered, because of contracts for other equipment, placed some time ago. The railroad traffic situation is not much better. Heavy tonnages of finished material are being accumulated in mill yards, because of the scarcity of cars or the lack of motive power.

Get Government Allotment

Philadelphia, May 7.—Apportionment of the government's plate requirements which are covered by the agreed price of 2.90c, Pittsburgh, is under way. At least one eastern Pennsylvania mill has been offered a large tonnage with the request that it should regard it as a portion of its allotment of the government's requirements. Other business offered to the makers continues to aggregate thousands of tons each day, but practically all of this is being refused, the makers not even quoting, excepting on a negligible portion. The mills continue to follow the policy of refusing to take on new work until they are able to reduce the unfilled orders now on their books. The only exceptions to this rule are in the case of small lots, which, for special reasons, can be handled for shipment at the mills' convenience. Official prices are unchanged, but fully ½c more a pound than these prices is being paid as a rule on the small lots which find their way into the books.

Plate Demand Increases

Buffalo, May 8.—Mills and agencies of the district report a marked increase in the demand for plates for ship construction and prices have stiffened to 8.50c to 10c, base. Preferential rollings for government needs may force the cancellation of tonnages booked for individual needs and may work hardships on some private consumers.

Lake Builders Quoted 10c

Cleveland, May 8.—On several thousand tons of ship plates Cleveland shipbuilders were quoted 10c, Pittsburgh, this week. On 1,000 tons of structural tank plates for delivery in 30 to 60 days, 7.50c, Pittsburgh, was offered by the buyer but could not be accepted by the mill.

Government Buys at Chicago

Chicago, May 8.—Although plate mills are sold as far into the future as their policies will permit, demand for this form of finished steel has not abated and both domestic and export buyers continue to bombard makers with inquiries, offering most tempting prices for reasonable deliveries. While a quotation of 4.69c, Chicago, has been made recently, it is doubtful if much could be placed at that figure and prices ranging as high as 10c have been quoted. The first government order placed with a western mill was filled by the leading interest, involving about 1,000 tons of plates and structurals for shipment to the Mare Island navy yard.

(*For miscellaneous prices see page* 1058.)

Guard Tin Plate

To Insure Full Food Supply—Market is Bare

Pittsburgh, May 8.—Federal officials are still apprehensive about the manufacture of food containers, and various conferences are being held at this center, Chicago and Washington, in an effort to bring relief to American packers. Tin plate makers today are meeting at this city to co-operate further in assisting the nation during the war. Packers supplying land and sea forces with food are being given preference by tin plate makers. Scarcely any material is finding its way to the open market. The 7.50c and 7.75c prices, at which books were opened for shipment in the second half, have disappeared. Tin plate for both spot and future shipment is quotable at 8c to 10c.

Little Tin Plate Offered

Philadelphia, May 8.—It continues difficult to buy tin plate here and the only offerings to be had are wasters or small lots on the stock list. The prevailing level on tin plate on stock lists now is $9 per base box.

Buy Many Sheets For War

Miscellaneous Needs of Government Require Numerous Tonnages —Auto Builders Seek Stock Vigorously—Prices Strong

Pittsburgh, May 8.—With the government placing contracts for heavy tonnages of sheets for immediate delivery, most manufacturers have withdrawn from the domestic market to await developments. While government purchases do not involve any large single orders, yet these demands have absorbed virtually all the stock which was available for early shipment. Scarcely enough tonnage is being sold in the open market to afford a line on quotations. Small tonnages of black sheets have been sold this week for fourth quarter at 7.15c and blue annealed sheets for similar shipment at 6.50c. Galvanized stock is commanding 9c, base. About 45 per cent of the galvanizing capacity of sheet mills in this district is engaged.

Automobile Makers Pick Up Stock

Automobile builders, inconvenienced by deferred deliveries on contracts, are combing this territory for additional tonnages for prompt shipment. Various purchases of odds and ends have been made on the basis of 8c to 9c. The Ford Motor Car Co., Detroit, recently bought automobile stock in the open market at 8c, base. Electrical equipment manufacturers also are scrambling for additional material. Electrical sheets are commanding premium prices for foreign delivery.

Very Scarce in Valley

Youngstown, May 8.—Black sheets cannot now be bought in the valley at less than 8c for No. 28, bessemer, blue annealed, No. 10, bessemer, are held at 7.50c, and each small lot of galvanized as may be had from only one maker are reported to have brought 10c. One or two sheet makers are taking care of the needs of customers of long standing, but are not selling openly. The odd lots in stock have nearly all been disposed of, at prices slightly below the current market. Some of these odd lots were rolled when sheets cost less than half their present price. Little or no further government work, beyond that of ordinary character, is coming into the valley just now. The manufacturers are awaiting the allotments to be made by the iron and steel committee. Some of the companies are sold up for several months ahead; those who are not show no disposition to take on any further business, except with old-time customers, contingent upon government needs. Virtually, it can at present be said there is hardly any real sheet market in the Mahoning valley. Buyers who are fortunate enough to get a definite line on even a small tonnage are willing to pay just what the seller asks them. In many cases orders, and even inquiries, have left the price entirely open and at the decision of the sales manager. The traffic situation remains unsatisfactory.

Government Orders Freely

Philadelphia, May 7.—Distribution of tonnage for the manufacture of government requirements continues the leading business in the sheet market in this district. Included in the business placed this week is one lot of 1,500 tons, another of 250, another of 200 and other tonnages, closed either directly by the government or by concerns making sheet products, such as cartridge cases, camp ranges and other sheet products for the government. The makers of sheets on government business are quoting material concessions. The prevailing quotation continues 6.50c, Pittsburgh, on No. 10 gage blue annealed sheets, for third quarter, but this figure is nominal, as little excepting government business is being taken.

Artillery Cars Are Bought

By Government From Pennsylvania Railroad—Foreign Lines Still Buying Motive Power—Rails Quiet

New York, May 9. (By wire.)—The Altoona shops of the Pennsylvania railroad will build 22 100,000-pound cars for the government for transporting of guns and armor plate.

Car inquiries include 150 center constructions for the Paris Orleans railway, 1,625 underframes for the Rock Island and 50 gondolas for the Bethlehem Steel Co.

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Buy Many Sheets For War

Miscellaneous Needs of Government Require Numerous Tonnages —Auto Builders Seek Stock Vigorously—Prices Strong

Pittsburgh, May 8.—With the government placing contracts for heavy tonnages of sheets for immediate delivery, most manufacturers have withdrawn from the domestic market to await developments. While government purchases do not involve any large single orders, yet these demands have absorbed virtually all the stock which was available for early shipment. Scarcely enough tonnage is being sold in the open market to afford a line on quotations. Small tonnages of black sheets have been sold this week for fourth quarter at 7.15c and blue annealed sheets for similar shipment at 6.50c. Galvanized stock is commanding 9c, base. About 45 per cent of the galvanizing capacity of sheet mills in this district is engaged.

Automobile Makers Pick Up Stock

Automobile builders, inconvenienced by deferred deliveries on contracts, are combing this territory for additional tonnages for prompt shipment. Various purchases of odds and ends have been made on the basis of 8c to 9c. The Ford Motor Car Co., Detroit, recently bought automobile stock in the open market at 8c, base. Electrical equipment manufacturers also are scrambling for additional material. Electrical sheets are commanding premium prices for foreign delivery.

Very Scarce in Valley

Youngstown, May 8.—Black sheets cannot now be bought in the valley at less than 8c for No. 28, bessemer, blue annealed, No. 10, bessemer, are held at 7.50c, and each small lot of galvanized as may be had from only one maker are reported to have brought 10c. One or two sheet makers are taking care of the needs of customers of long standing, but are not selling openly. The odd lots in stock have nearly all been disposed of, at prices slightly below the current market. Some of these odd lots were rolled when sheets cost less than half their present price. Little or no further government work, beyond that of ordinary character, is coming into the valley just now. The manufacturers are awaiting the allotments to be made by the iron and steel committee. Some of the companies are sold up for several months ahead; those who are not show no disposition to take on any further business, except with old-time customers, contingent upon government needs. Virtually, it can at present be said there is hardly any real sheet market in the Mahoning valley. Buyers who are fortunate enough to get a definite line on even a small tonnage are willing to pay just what the seller asks them. In many cases orders, and even inquiries, have left the price entirely open and at the decision of the sales manager. The traffic situation remains unsatisfactory.

Government Orders Freely

Philadelphia, May 7.—Distribution of tonnage for the manufacture of government requirements continues the leading business in the sheet market in this district. Included in the business placed this week is one lot of 1,500 tons, another of 250, another of 200 and other tonnages, closed either directly by the government or by concerns making sheet products, such as cartridge cases, camp ranges and other sheet products for the government. The makers of sheets on government business are quoting material concessions. The prevailing quotation continues 6.50c, Pittsburgh, on No. 10 gage blue annealed sheets, for third quarter, but this figure is nominal, as little excepting government business is being taken.

Artillery Cars Are Bought

By Government From Pennsylvania Railroad—Foreign Lines Still Buying Motive Power—Rails Quiet

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Need Big Structural Block

Government's Direct and Indirect Building Demands About 100,000 Tons—Ordinary Commercial Work is Stifled

Pittsburgh, May 8.—More than 100,000 tons of fabricated material are involved in pending inquiries sent out directly or indirectly by the government. These involve crane runways, machine shops, erecting plants, aeroplane hangars, and the like. Material will be shipped to points along the Atlantic seaboard from Maine to Florida. Some demand exists for shipment to the far west. Some of the inquiries include: Machine shop and foundry for Norfolk, 5,200 tons; hangar, Pensacola, Fla., 1,000 tons; naval towers, Porto Rico, 900 tons; and miscellaneous work. Demands of the government make it increasingly difficult for erectors of commercial buildings to obtain steel. Numerous contemplated structural undertakings have been abandoned temporarily, partly for patriotic purposes, but largely because of the inability of fabricators to meet specifications for delivery. Contracts for domestic work are being accepted subject to demands of the nation. Structural shapes for delivery at the convenience of the mill are being held at 4c and above. Several of the larger manufacturers have withdrawn from the market.

Eastern Demand Active

Philadelphia, May 8. — Demand for plain structural shapes continues active and a number of buyers, principally jobbers, want lots of 500 to 1,000 tons. The mills are booked ahead to such an extent, however, that they are refusing practically everything that is offered with the exception of small lots which they can conveniently handle. Prices are from 4.50c to 5c, Pittsburgh. The inside price is minimum on material sold at mills' convenience and the outside figure pertains to preferred deliveries. Special sections now are sold three or four months ahead while standard sections are practically cleaned out for the rest of the year.

Shapes Getting Scarce

Buffalo, May 8.—Inquiries for large tonnages of shapes for ship construction are coming into the market as a part of the government plan. This situation is having a tendency of holding back commercial and industrial construction.

Prices Discourage Work

Cleveland, May 8. — With fabricated work selling at from 7c to 8c per pound, few builders are disposed to proceed with new structural work except where the job represents a profitable addition to industrial capacity. The market almost is bare of new work. Bids on the 3,800 tons for the Cleveland city auditorium have been deferred to May 14. The mills are asking at least 4c, Pittsburgh, or 4.105c, Cleveland, on any quotations that they make, which are few. Eastern mills ask 4.50c, mill, or 4.704c, Cleveland, for shipment at convenience.

Tonnages are Small

Chicago, May 8.—While demands for large tonnages are not being entertained, the aggregate of business made up of small inquiries, averaging about a carload each, makes a fair total. Apparently the present prices are discouraging construction where steel is a large element, but its use for incidental construction in frame and brick buildings continues wide. The largest tonnage placed in the west during the past week involves 615 tons. Prices on plain materials range from 4.19c to 5.19c, Chicago.

CONTRACTS PLACED.

Steel work for buildings "E" and "C" of repair shops at St. Louis, Mo., for Pullman Co., 615 tons, to Kenwood Bridge Co.

Strauss trunnion bascule bridge over the Elizabeth river at South Front street, Elizabeth, N. J., for Great Lakes Dredge & Dock Co., 332 tons.

Warehouse at San Francisco, Cal., for Union Iron Works, 280 tons, to Western Iron Works.

Ten-story apartment building for Dr. M. L. Blatt at Surf street and Pine Grove avenue, Chicago, 266 tons of reinforced concrete.

Randolph Central office building at Minneapolis, Minn., for Northwestern Telephone Exchange Co., 193 tons, to Minneapolis Steel & Machinery Co.

Elevator at Council Bluffs, Iowa, for Chicago & Northwestern Railway Co., 190 tons, to independent shop.

Store and apartment building, Minneapolis, Minn., for Inter-City Realty & Loan Co., 185 tons, to independent shop.

Highway bridge over Republic river near Fort Riley, Kan., 151 tons, to independent shop.

Mill buildings for Pittsburgh Steel Products Co., near Charleroi, Pa., 3,000 tons, to McClintic-Marshall Co.

Bridges for the Pennsylvania railroad, 250 tons, to American Bridge Co.

Building for General Electric Co., Schenectady, N. Y., 500 tons, Blaw Construction Co.

Garage, 227 East Fifty-sixth street, New York, to Hinkel Iron Works.

Building at Schenectady, N. Y., to Belmont Iron Works.

Town Hall, Plattsburg, N. Y., to local fabricator.

Power house, Yale University, New Haven, Conn., to Levering & Gerrigues.

Plant of Harroun Motor Co., Cleveland, 500 tons, principally roof truss, to Massillon Bridge & Structural Co.

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CONTRACTS PENDING.

Bridge for Philadelphia & Reading railroad, 300 tons, bids being taken.

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Wharf shed for Revere Sugar Refining Co., Boston, 1,000 tons, bids being taken.

Bridges for Chesapeake & Ohio railroad, 500 tons, bids being taken.

Penn-Harris hotel, Harrisburg, Pa., 2,000 tons, bids being taken.

Loft building, 15 Leonard street, New York, 500 to 600 tons, bids being taken.

O. Henry Hotel, Greensborough, N. C., 500 tons, bids being taken.

Foundry at Norfolk, Va., navy yard, 2,000 tons, bids to be opened May 21.

Building for Hershey Chocolate Co., Hershey, Pa., 1,000 tons, bids being taken.

Three 600-foot steel towers for Porto Rico, 900 tons, bids to be opened May 28 by bureau of yards and docks, navy department.

Machine shop at Norfolk navy yard, 3,200 tons, bids to be opened May 21.

Storage shed at New Orleans naval station, 250 tons, bids to be opened May 21.

Bridge for Central Railroad of New Jersey, 550 tons, bids being taken.

Bridges for New York Central, 450 tons, bids being taken.

Magazine, shell house and office building, Fort Mifflin, 200 tons, McClusky & Bahls, low on general contract.

Vanderbilt residence, Lenox, Mass., 200 tons, bids being taken.

Aeroplane hangar, Pensacola, Fla., 1,000 tons, H. Monk, Pensacola, low bidder, McClintic-Marshall Co. low on alternate plans.

Government Buys

Wire Products Freely, But Details Are Not Divulged

Pittsburgh, May 8.—Independent wire makers continue to sell on the basis of $3.50 a keg for nails, the price adopted April 17, although the American Steel & Wire Co. has made no changes in its quotations since March 5, last, when prices were boosted $4 a ton to $3.20 a keg for nails. Virtually all the leading manufacturers have withdrawn from the market. The United States government has been an active buyer of material, much more active than generally believed. Details of government purchases, however, are not made known. Shippers continue to buy only for actual needs and their stocks are extremely low.

Quote Nails at 4c

Cleveland, May 8.—Independent makers of wire products have been quoting up to 4c, Pittsburgh, for higher mills. Few quotations are being made, however, as producers have not the material to offer. The American Steel & Wire Co. has made no change in its 3.20c, Pittsburgh price, but is not selling in the open market.

The Eastern Steel Co. blew in its No. 2 Warwick stack at Pottstown, Pa., April 19.

Higher Coke

For Quick Delivery Appears as Car Supply Declines

Pittsburgh, May 8.—Connellsville furnace coke for spot shipment has advanced $1.25 a ton this week to $8.25 as a minimum, with several sales reported at $8.50, ovens. Several blast furnace interests have been driven into the market for prompt fuel on account of retarded deliveries. The car supply in the Connellsville regions last week dropped to 55 per cent, compared with 60 per cent the week before. This week, the supply has dropped from 75 per cent on Monday to 40 per cent today, with a 60 per cent supply in view for tomorrow. An eastern steel manufacturer with by-product coke ovens has entered the Connellsville market for 10,000 tons of furnace coke a month for shipment over a 9-month period, beginning July 1. Contract furnace fuel nominally is listed at $8, ovens. The market for foundry coke is unchanged, although prices appear to be stiffening. Production of coke the week ending April 28 was 379,778 tons, compared with 359,533 tons the week before, according to *The Connellsville Courier*.

Ask $9 on Foundry

Philadelphia, May 8.—Quotations on foundry coke show an advancing tendency here. On contracts covering six, nine or 12 months beginning July 1, $9, Connellsville ovens, now is the minimum on coke, which a little more than a week ago was selling at $8.50. Sales of several thousand tons for contract delivery have been made during the week. Spot coke, which a week or more ago could have been had at $9.50, Connellsville ovens, now is holding at $10.

Federal Needs Rule

Cleveland, May 8.—Contracts for southern coal and coke, effective May 1, contain a new clause stipulating that all contracts will be subject in whole or in part to the needs of the federal government, and shall be subject to immediate cancellation should occasion arise.

Coke is Drifting

Cincinnati, May 7.—The coke market is drifting along with very little activity by either buyers or sellers. Some dealers are not soliciting business because they are unable to take care of present contracts, and the majority of users in this territory are well covered for future requirements. Foundry coke from southern districts is held from $8 to $10, furnace, for contract delivery, and from $10 to $12, for prompt shipment.

Deliveries are Better

St. Louis, May 5.—The demand for coke in this district continues active, but prices are a shade easier. The range continues from $9.50 to $10.50, ovens, for Connellsville and Virginia 72-hour coke, but more business is being done at the lower end of the spread. Buyers and sellers are disposed to hold off, and as a result business is relatively quiet, and confined to a few car lots.

Mexico Figures on Coke

Birmingham, Ala., May 8.—Coke production in southern territory shows improvement, and demand remains just as strong as at any time during the past six to twelve months. Negotiations are on for an indefinite contract for coke for shipment out of the district, to the smelter plants in Mexico. Quotations range from $6 and $8 on furnace coke and $8 to $10.50 on foundry coke. Small sales of foundry coke have been made around $12.50 to $15 per ton. The starting of the by-product oven plant of the Gulf States Steel Co. has increased production. The Sloss-Sheffield Steel & Iron Co. expects to get in some of its 288 ovens at the city furnaces during this month and by the middle of June to have the whole battery going.

Delay Cuts Ore Movement

Late Opening of Lake Season Curtails Shipments But Vessel Men Are Confident

Cleveland, May 9.—The navigation season on the Great Lakes is gaining momentum rapidly. The long delay, caused by the ice barriers that blocked navigation at the Soo and at Buffalo, has set the fleet back more than two weeks, or the equivalent of about 3,000,000 tons of iron ore. Several favorable factors, however, cause the ore and vessel interests to face the future confidently despite this unexpected delay in opening navigation.

The big bulk freighters will now begin carrying maximum cargoes of ore as the water levels on the lakes are high. The St. Clair channel, which was dredged last year, permits much deeper loading now than a year ago and record cargoes can be expected from now on. Each extra inch of draft represents about 100 tons additional for the big boats, so that the importance of the deeper water is apparent. A number of new boats also are in commission this spring, with additional vessels about ready to go into service.

A third favorable factor is the action of the general railroad board at Washington, in ordering the railroads to give preference to iron ore and coal traffic. The placing of the iron ore transportation problem under the control of a central committee also insures effective co-operation of all interests in swelling this year's ore movement.

These factors influence many vessel men to believe that the paper loss of 3,000,000 tons shown so far this season will be overcome. If not, they point to the fact that in 1916 more ore was brought down from the Lake Superior district than the blast furnaces consumed, providing a reserve that will aid in tiding the furnaces through the winter.

The following table shows the opening dates for the past 10 years at the Soo canal and Straits of Mackinaw. The 1917 figure is deceptive, as ice blocked the channel after the first boat had passed. The figures follow:

	—Soo Canal—		Straits of Mackinaw.
	Opened.	Closed.	Opened.
1917	April 24	.....	April 22
1916	April 20	Dec. 19	April 17
1915	April 18	Dec. 20	April 17
1914	April 23	Dec. 17	April 19
1913	April 26	Dec. 18	April 19
1912	April 24	Dec. 19	April 21
1911	April 22	Dec. 16	April 15
1910	April 15	Dec. 14	April 6
1909	April 20	Dec. 11	April 14
1908	April 27	Dec. 13	April 19

April Shipments Heavy

Ore shipments from Lake Erie docks to interior furnaces in April aggregated 2,020,903 tons, against 1,979,247 tons in April, 1916. The movement during the winter, however, was less than in the previous year so that the ore balance on May 1, 1917, was 1,460,833 tons greater than on the same date last year. The 1917 balance was 4,772,232 tons, against 3,311,399 tons on May 1, 1916. The delay in opening the lake season has permitted the docks to clean up during the past week, so that by the time the ore fleet begins to reach lower lake ports, the docks will be in excellent shape.

The ore receipts at Lake Erie ports in April were light, totaling 51,988 tons against 409,373 tons in April, 1916. Lake Michigan ports received 26,527 tons in April, against 189,824 tons in April, 1916.

The April shipments from upper lake ports were 211,532 tons against 1,658,411 tons in April, 1916.

(*For miscellaneous prices see page* 1058.)

Refractories Rise

Sharply All Along the Line—War Trebles Prices

Pittsburgh, May 8.—Following similar advances in other sections of the country, manufacturers of refractory materials in western Pennsylvania have boosted prices $5 all along the line. Since the outbreak of the war in Europe, nearly all grades of firebrick have almost trebled in price. This, however, is not surprising, in view of the tremendous demand for blast furnace and open hearth construction. Pressure has been so great that manufacturers' stocks are depleted and deliveries are deferred from 90 days to a year.

Pennsylvania clay brick of first quality now is held at $45 to $55 per thousand. For some time before the war, this grade was offered at as low as $16.50 a thousand. Second quality clay brick is quoted at $35 to $45. Second quality brick generally is scarce. Ohio second quality has been sold as high as $44 at makers' works. The demand for fire brick is very strong in all sections and inquiries are active. In some territories makers are quoting present prices only for shipment during May.

Chrome brick, described as scarce, is listed at $125 to $135 per net ton at the works. Greecian magnesite brick, 9 x 4½ x 2½, is selling at $135 to $145, compared with about $35 a ton before the war. Silica brick has jumped from $45 to $50 as a minimum, with some makers asking $60 per thousand.

A heavy demand prevails for export. Fire brick makers in this district say they are unable to entertain these inquiries, because of the tremendous demand for domestic shipment. Premium prices are being paid for refractory materials for lining and patching furnaces.

Will Buy Shells

Washington, May 9. — Bids will be opened May 15 for 4,500,000 3-inch high-explosive and 3,700,000 shrapnel shells for the United States army and navy. A large number of high-explosive shells will be bid on later. The requirements of the government for field guns and carriages are tremendous. Heavy purchases will be made of anti-aircraft artillery.

Chrome Ore Strong

New York, May 8.—The market on chrome ore continues strong due not only to the good demand but to the fact that it is becoming increasingly difficult to bring in foreign ore. Sales of further tonnages of Canadian ore averaging 30 to 35 per cent chrome oxide have been made this week on the basis of $32.50 to $35, delivered, for 30 per cent ore. This range applies to ore in lump form.

A. S. M. E. Program

Munitions and Machine Shop Sessions to Feature Cincinnati Meeting

In keeping with the spirit of the times and the character of the city's chief industry, the manufacture of munitions and machine shop practice will be the principal subjects to engage the attention of members of the American Society of Mechanical Engineers who attend the spring meeting at Cincinnati, May 21-24. Monday, the first day of the meeting will be devoted to registration at Hotel Sinton, a meeting of the council, and an informal reception. A smoker for the men and a reception for the ladies Tuesday evening, a boat ride on the Ohio Wednesday afternoon, an informal dance that evening, and visits to points of interest near Cincinnati are features of the entertainment provided.

Following a business session Tuesday morning, two professional sessions will be held as follows:

MACHINE SHOP SESSION.

"A Foundation for Machine Tool Design and Construction," by A. L. DeLeeuw.

"Machine Shop Organization," by Fred G. Kent.

"Metal Planers and Methods of Production," by Charles Meier.

GENERAL SESSION.

"Tests of Uniflow Steam Traction Engines," by F. W. Marquis.

"Relation of Efficiency to Capacity in the Boiler Room," by Victor B. Phillips.

"Radiation Error in Measuring Temperature of Gases," by Henry Kreisinger and J. F. Barkley.

"Development of Scientific Methods of Management in a Manufacturing Plant," by Sanford E. Thompson and associates.

"Disk Wheel Stress Determination," by S. H. Weaver. (By title only.)

At 2:30 p. m., Tuesday, the members of the National Machine Tool Builders' Association and the American Society of Mechanical Engineers will meet in joint session. Dean Herman Schneider will deliver an address on "The Trend in Engineering Training", and Dr. Otto P. Geier will speak on "The Human Potential in Industry".

The program of the first munitions session, scheduled for Wednesday morning, is as follows:

Opening remarks by Major E. D. Bricker, ordnance department, Frankford Arsenal, and Lieut. T. S. Wilkinson Jr., U. S. N., bureau of ordnance.

"Munitions Contracts and Their Financing," by Frederick A. Waldron.

"Organizing for Munitions Manufacture," by Arthur L. Humphrey.

"Organization for Munitions Manufacture," by Harry L. Coe.

"Procuring Special Machines for Munitions Manufacture," by H. V. Haight.

"Practical War-Time Shell Making," by Lucien Yeomans.

The programs for the simultaneous sessions Thursday are as follows:

SECOND MUNITIONS SESSION.

"The Design of Munitions for Quantity Manufacture," by J. E. Otterson.

"Procuring Materials for Munitions," by C. B. Nolte.

"Limits and Tolerances for the Manufacture of Munitions," by A. W. Erdman.

"Gages and Small Tools," by F. O. Wells.

"The Importance of Intelligent Inspection in Munitions Manufacture," by E. T. Walsh.

GAS POWER SESSION.

"The Problem of Aeronautical Engine Design," by C. E. Lucke.

"Test of a Motor Fire Engine," by Horace Judd.

"Design of Motor Truck Engines for Long Life," by John Younger.

"Relation of Port Area to the Power of Gas Engines and Its Influence on Regulation," by J. E. DuPriest.

INDUSTRIAL SAFETY SESSION.

Proposed Code of Safety Standards for Industrial Ladders.

Refractories

(Per 1,000 f. o. b. works.)

FIRE CLAY BRICK.
(First Quality.)

St. Louis No. 1	$40.00 to 50.00
St. Louis High Grade	55.00 to 65.00
Pennsylvania	40.00 to 50.00
Ohio	42.00 to 45.00
Kentucky	40.00 to 45.00
New England	

FIRE CLAY BRICK.
(Second Quality.)

Pennsylvania	$30.00 to 45.00
Ohio	32.00 to 37.00
New England	

SILICA BRICK.

Pennsylvania	$50.00 to 60.00
Chicago	55.50 to 65.50
Birmingham	45.00 to 55.00

MAGNESIA BRICK.
(Per Net Ton.)

Grecian, 9 x 4½ x 2½	$135.00 to 145.00

CHROME BRICK.

Per net ton	$125.00 to 135.00

Two Plate Mills

To Enlarge Finishing Capacity of Brier Hill Steel Co.

Two new plate mills with the capacity of 200,000 tons annually are to be built for the Brier Hill Steel Co., Youngstown, by the United Engineering & Foundry Co., under contracts just awarded. One will be a 32 x 84-inch tandem mill and the other 38 x 132-inch three-high, with full equipment. The cost is estimated at about $1,500,000. The mills are to be ready for operation early next year and will take about 30 per cent of the ingot production of Brier Hill's 12 open hearth furnaces. The company's sheet mills have an annual capacity of about 200,000 tons.

(*For miscellaneous prices see page* 1058.)

Weigh Distribution of War Steel

Implement Tonnage is Needed

Chicago, May 7.—Makers of agricultural implements are pressing hard to have their requirements for steel, especially sheets and bars, as well as wood and other materials, placed on the preferred list the same as material for munitions. This is being done to assure that this branch of manufacturing will aid to its fullest extent in the production of the large crops so necessary in waging war.

The National Implement and Vehicle Association has had representatives at Washington for a fortnight working with the government and with representatives of steel and other manufacturers to this end. It was proposed at first that 50 per cent of the requirements of implement makers be allotted them and more recently this has been increased to 75 per cent. This is not considered sufficient, however, and the full estimates are insisted on as necessary, the manufacturers say, if agriculture is to be maintained efficiently and demand for additional machinery for Europe is to be met.

In a circular about to be sent to its members the association says: "What we are contending for is that our industry shall be placed on the preferred list with munitions and other equally important necessaries in guaranteeing an uninterrupted supply of all necessary materials, the protection of our labor against draft, and that there shall be no transportation embargoes applying to either the materials entering into implements nor to the distribution of the finished product."

Investigation by agents of implement makers indicates that crops of the present year can be produced with implements already available, but preparations must be made at once for the supply that will produce the next crop. Plowing for fall crops will begin in the southwest in 40 days. Plans for production must be made and work started by implement builders by July 1 for the succeeding year. Officers of the National and Eastern Dealers' Federations have investigated the situation and find that stocks are low and that farmers have not replenished their equipment as usual in view of higher prices. These factors produce a condition of short supply which must be met if larger production is to be achieved. While the offer has not been made officially, implement men are willing to operate on a basis of 10 per cent profit above costs as a contribution to the general good.

Steelmakers are willing to devote their output as government directs for the greatest good, and will change schedules to supply implement makers if their requirements are made preferential. The latter have been placed on an equality with other buyers, all of whom have had to submit themselves to a reduction in tonnage.

Zinc Producers Fix Lower Prices to Government

Reduced prices for slab zinc for government purposes have been fixed by the zinc committee of the advisory commission of the council of national defense and all producers now are being solicited to stipulate the amounts they are willing to supply for war purposes under this arrangement.

The agreed prices are 11.50c per pound for grade A; 11c for grade B; and 9c for grade C for carload lots with freight allowed to New York delivery rate points. The price of grade C is protected against decline. During the war grade A metal has sold as high as 42c per pound and the market when the prices to the government were fixed was 18c; grade C metal sold up to 27.50c during the war and was bringing 10c when the prices to the government were determined.

Urge Nation to Conserve Tin Plate Needs

Washington, May 8.—Sweeping recommendations regarding the conservation of the supply of tin plate and cans to insure ample facilities for the packing of the perishable crops of 1917 have been made by a committee of tin plate makers, tin can manufacturers, the National Canners' Association, and the National Wholesale Grocers' Association.

Although, appreciating this, the senate has adopted an amendment to the administration espionage bill, giving the President discretionary authority to declare an embargo on export shipments of tin plate and tin containers, it is believed that this extraordinary action was unnecessary. The committee recommends that the tin plate makers "Give preference to the delivery for containers for perishable foods and that they refrain from shipment of plate to those packers making their own cans where such are likely to be used for packing non-perishable products."

Keep Ore Moving Says Committee

Pittsburgh, May 8.—Having completed plans for mobilizing equipment suitable for the transportation of iron ore and coal, special committees, cooperating with the council of national defense, now are appealing to individual consumers of iron ore to unload cars as quickly as possible. If cars are allowed to stand idly on tracks, it will be impossible to move sufficient quantities of Lake Superior iron ore to meet domestic demands.

C. D. Dyer, vice president of the Shenango Furnace Co., Pittsburgh, who is chairman of the lake shippers' committee, has sent a letter to consumers of Lake Superior iron ore, asking them to "keep cars moving". Mr. Dyer suggests that "each company accept forthwith as a duty, the same concern in using the cars as if owned by them, in order that the railroads be enabled to fully discharge their duties to the country in its emergency".

B. M. Baruch, chairman of the advisory committee on raw materials, minerals and metals of the council of national defense, has appointed a subcommittee on pig iron, iron ore and lake transportation, members of which are: H. G. Dalton, Pickands, Mather & Co., Cleveland; Leonard Peckitt, president, Empire Steel & Iron Co., Catasauqua, Pa.; J. H. Woodward, president, Woodward Iron Co., Woodward, Ala.; W. P. Shephard, Rogers, Brown & Co., Buffalo; F. B. Richards, M. A. Hanna & Co., Cleveland; Frank Billings, Tod, Stambaugh & Co., Cleveland; Harry Coulby, president, Pittsburgh Steamship Co., Cleveland.

It is estimated the requirements of the government and of the domestic trade will be from 60,000,000 to 65,000,000 tons of iron ore. Approximately 2,000,000 tons of ore, shipped last season, was on lower lake docks at the opening of navigation this year.

Mr. Dyer has been requested to appoint a committee to attend a conference at Washington, Friday, May 11, to consider the pooling of lake coals and the handling of equipment entering into the transportation of fuel.

The H. Koppers Co. has removed its offices from the First National Bank building to the Union Arcade building, Pittsburgh.

Ingot Production

In April Shows Big Drop from Record Set in March

Steelmaking furnaces produced about 10 per cent less in April than in March. This fact is revealed by the reports furnished *The Iron Trade Review* by the big majority of the independent steel-producing companies.

Reports received up to the time of going to press showed a production in April of 965,791 tons by companies which produced 1,109,592 tons in March, a decline last month of 143,801 tons. Reducing these figures to the basis of average daily production, the April average production of these companies was 32,193 tons against an average of 35,793 tons in March, a loss of 3,600 tons or slightly more than 10 per cent. Pig iron production in April gained slightly more than 5 per cent over March.

Steel Ingot Output

Reports From Same Companies.

	April.	March.
Basic O. H. ingots...	750,985	872,350
Acid O. H. ingots....	28,285	29,678
Bessemer ingots	182,600	203,413
Elec. furnace ingots..	3,921	4,151
Totals	965,791	1,109,592

All Reports Received.

	March.	Feb.	Jan.
Basic O. H..	968,788	812,152	921,385
Acid O. H..	46,219	41,200	47,477
Bessemer ...	212,765	187,351	202,971
Elec. furnace.	6,584	4,864	5,326
	1,234,356	1,045,567	1,177,159

The accompanying table shows the April figures with corresponding totals for March from the same companies. In addition, the table shows the gross total of all returns received in the first three months of the year. These show a production in January of 1,177,159 tons, in February of 1,045,567 tons, and in March of 1,234,356 tons. The average daily production was 37,972 tons in January, 37,342 tons in February and 39,818 tons in March.

Foreign Buyers

Take Steel Products from Warehouses —Advances Still Continue

New York, May 8.—Demand for material out of warehouse continues exceedingly heavy in this district from all kinds of domestic sources and also from abroad. The foreign demand involves particularly steel bars and sheets. In view of the heavy domestic requirements, which keep the warehouses hustling to keep their stocks replenished, these interests are not inclined to pay much attention to export business. Several quotations have been advanced during the week. The present level is as follows: Plain shapes, 5c; plates, 7c; soft steel bars, 4.75c; reinforcing bars, 4.85c; iron bars, 4.50c; No. 10 gage blue annealed sheets, 7c; No. 28 gage 1-pass cold rolled sheets 7.75c; No. 28 gage galvanized sheets, 9.75c.

Store Prices Under Mills

Philadelphia, May 8.—Demand for iron and steel out of warehouse continues exceedingly active. The interesting feature of this business is that on some products prices now are lower than the figures which are being obtained by the mills. For instance, tank plates are going out of warehouse at 7c and shapes at 4.75c to 5c, whereas the mills already have done higher than this price on plates and have made sales of shapes at 5c. The warehouse quotation on steel bars is 5c; on iron bars, 4.50c; while shafting is quoted at list plus 15 down to 10, depending on the size.

Store Sheets Higher

Chicago, May 8.—Chicago warehouses have announced advances of $10 per ton on blue annealed sheets, and $5 per ton on black sheets. This brings the quotation on No. 10 blue annealed to 7c, and on No. 28 gage black sheets to 7.50c, Chicago store. For the same material from St. Louis store, $1 per ton is added, and at St. Paul $2 per ton additional.

Sweeping Control

Over Steel Plants and Ship Yards Not Thought Likely

Washington, May 9. (By wire.)—Regardless of published statements, it is not believed by those having practical knowledge of the steel business and ship building that a revolutionary plan to take over the output of those industries and to cancel private contracts promiscuously, will be adopted. Authorities say government can execute its ship program most expeditiously by an orderly plan as to equitable distribution of steel and ship contracts and without unduly disturbing regular operations.

Many Millions

Added by Steel Corporation to Government Loan Subscription

New York, May 9. (By wire.)—The Steel Corporation has subscribed $25,000,000 to the liberty loan. This includes $5,000,000 recently subscribed but is exclusive of subscriptions by subsidiaries and officers, estimated at $25,000,000 more.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, May 8.—Lead has supplied the fireworks in the metal markets the past week. Following the recent advance of the American Smelting & Refining Co.'s base price to 9.50c, New York, the outside market jumped rapidly to a level fully 1c a pound higher. Sales for May delivery are reported at 10.50c, St. Louis, and of June at 10.37½c. The market now may be quoted about as follows: Prompt and May, 10.50c to 10.62½c, St. Louis; June 10.37½c to 10.50c.

The tin market has been strong and more active this week. Spot Straits sold at 59.-12½c, New York, today. Arrivals thus far this month have been extremely light, totaling only 525 tons prior to today. Consumers have been showing more interest in their requirements.

Copper has been in better demand, with higher prices. Sentiment in the trade has improved greatly because of belief that the government would pay at least 25c for the next lot of copper it buys. Electrolytic quotations, on the basis of cash, New York, are now about as follows: Prompt, 33c; May, 32.50c; June, 31.50c to 32c; third quarter, 29.50c to 30c; fourth quarter, 27.50c to 28c. Broader inquiry for casting copper has developed, and prices for this grade have advanced to about 29.50c to 30c for prompt delivery. Prime lake copper is quoted nominally 32.50c to 33c for prompt delivery.

The announcement that the government had arranged with the zinc committee to pay 11.-50c for Grade A spelter, 11c for Grade B and 9c for Grade C, appears to have had little market effect. After a brief period of activity culminating about a week ago, the spelter market quieted down and now is extremely dull. Prime western may be quoted as follows: Prompt and May, 9.25c, St. Louis; June, 9.12½c; third quarter, 9c. Brass special is quoted about 10c, St. Louis.

Spot antimony has dropped more than 10c a pound in the past week, due to heavy arrivals, metal being obtainable today at around 22c, duty paid, New York. Future positions, however, are strong. Chinese and Japanese brands, for April shipment from the far east are quoted 17c, in bond; May shipment, 15.50c to 16c; June shipment, $15.

The aluminum market is quiet and unchanged, with No. 1 virgin quoted about 62c to 64c in the outside market; No. 1 remelted, 98 to 99 per cent, 58c to 60c; No. 12 alloy, 42c to 44c. Aluminum sheets continue quoted about 77c to 80c in the outside market.

Prices of most descriptions of old metals have advanced the past week, in sympathy with the new metals, but the market has shown little activity. Copper and tin scrap are higher, while zinc scrap is a shade lower. Heavy copper crucibled is quoted 27.50c to 28c; light copper, 23.50c to 24c; zinc scrap, 7c to 7.50c; heavy lead, 8c to 8.50c; tea lead, 7c to 7.25c; block tin, 53c; old cast aluminum, 35c; old sheet aluminum, 43c.

(*For miscellaneous prices see page* 1058.)

The Metallurgy of Ferro-Silicon

Ferro-Silicon Ranks Second in Importance to Ferro-Manganese—The History of the Alloy is Reviewed and Its Manufacture in the Blast Furnace and in the Electric Furnace is Discussed

BY ROBERT J. ANDERSON

IN THE metallurgy of iron and steel, ferro-silicon is second in importance only to ferro-manganese from the standpoint of tonnage consumed. It is a singular fact that although electric-furnace ferro-silicon was first manufactured in the United States in 1898, it remained for European metallurgists, and particularly P. Girod, to develop its production on a large scale. Many plants are in operation on the continent of Europe, but until after the present war started there was but one large producer in the United States—the Electro-Metallurgical Co., with plants at Niagara Falls, N. Y., and Kanawha Falls, W. Va.

The first iron-silicon alloy made was prepared by Berzelius in 1810, who made an alloy containing 9 per cent silicon. His method called for the reduction, in a crucible, of silicon with iron and carbon. Shortly after this, in 1811, Strohmayer repeated the work of Berzelius, producing a series of alloys containing from 2.2 to 9.3 per cent silicon. In 1872, a 10 to 12 per cent ferro-silicon was made in the crucible by the reduction of silica and iron oxide with carbon, by Valten at Terre-Noire. Substituting iron turnings for iron oxide, and using silica and carbon as before, he secured an iron-silicon alloy containing 22 per cent silicon. The manufacture of blast furnace ferro-silicon became firmly established in 1875, when Pourcel made a 15 per cent ferro-silicon in the blast furnace at Terre-Noire, as well as a silico-spiegel at about the same time. Some 20 years later, Moissan prepared both ferro-silicon and silicides in conjunction with his exhaustive electric furnace experiments.

The alloy as formerly manufactured in the blast furnace was essentially a highly-silicated pig iron containing from 10 to 20 per cent silicon with an average of 14 per cent. Today ferro-silicon is produced chiefly in the electric furnace in grades containing 25 to 30, 45 to 55, or 70 to 80 per cent; and grades containing up to 90 per cent silicon are placed on the market. Harden has prepared iron-silicon alloys in a calcium carbide furnace with up to 98 per cent silicon. Electric furnace ferro-silicon was originally made by Moissan, and the first commercial manufacture was undertaken by the Wilson Aluminum Co. in the United States in 1898. The output was small. Prior to this, the manufacture of blast-furnace ferro-silicon had been conducted for a number of years. Ferro-silicon was the first electric-furnace ferro-alloy made in Europe, the production being started in 1899, at about the time the European carbide industry suffered its collapse. Many plants have since been started in Europe and, at present, are operating in France, Germany, Italy, Austria, Switzerland, Norway and Sweden.

In the first European plant which commenced making electric-furnace ferro-silicon, the attempt was made to produce the alloy in conjunction with calcium carbide. This mode of procedure, under the patents of Rathenau, proved unsatisfactory, so that both products had to be made separately. In the United States, there are a number of producers turning out blast-furnace ferro-silicon, and at least four companies are utilizing the electric furnace for its production. These latter include the Shawinigan Electro Products Co., Baltimore, operating a plant at Highlandtown, Md., employing three furnaces, and having a yearly output of from 10,000 to 15,000 tons of the 50 per cent alloy; the Keokuk Electro Products Co., operating three furnaces at Keokuk, Ia.; the Mohawk Development Co., operating one furnace at Fort Plain, N. Y.; and the Electro Metallurgical Co., the largest producer in the United States, with works at Niagara Falls, N. Y., and Kanawha Falls, W. Va. The present consumption of high grade ferro-silicon in the United States exceeds 45,000 tons per annum. A view of an electric-furnace plant

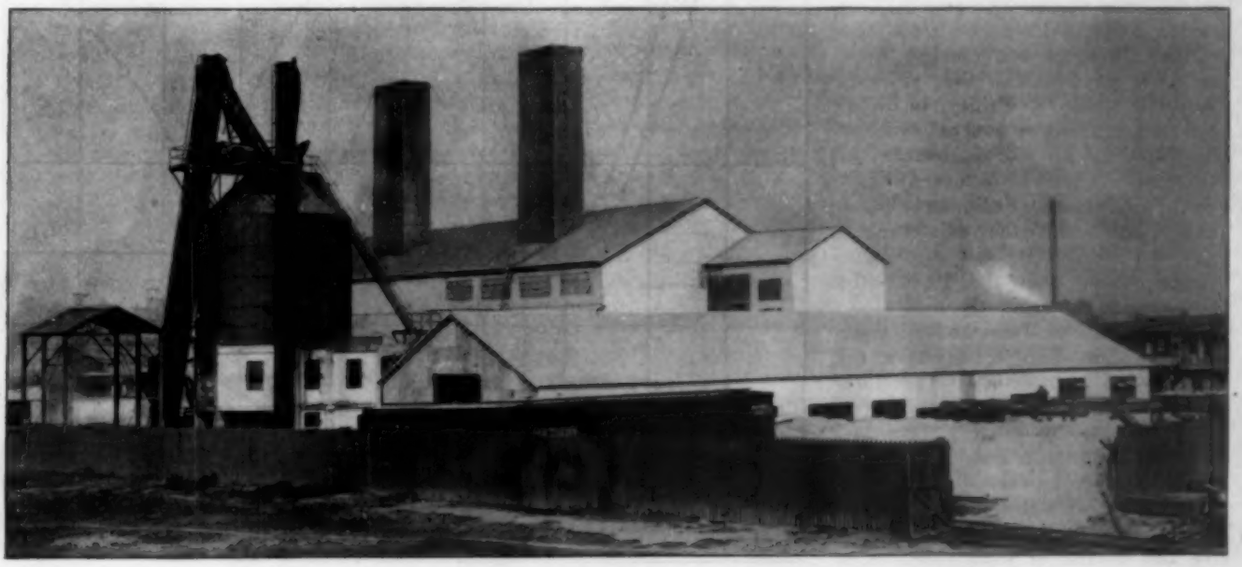

FIG. 1—ELECTRIC FURNACE PLANT FOR THE MANUFACTURE OF FERRO-SILICON

for the manufacture of ferro-silicon, recently completed by the Guarantee Construction Co., New York, is shown in Fig. 1.

Almost any alloy of iron and silicon is called ferro-silicon. Typical analyses of ferro-silicons, which have been used in the metallurgy of steel either for purposes of deoxidation of liquid metal or for fixed addition in the metallurgy of silicon steels, are given in Table I. Ferro-silicon is invariably crystalline in structure, and it may be coarsely or finely crystalline depending upon the silicon content. The silicon content of an alloy may be roughly judged by the appearance and color of the fractured surface. When the silicon content is less than 20 per cent, the fracture appears finely crystalline, but somewhat dull; with increasing percentages up to 30 per cent silicon, the crystallization is platelike or slaty, and the fracture brighter. Distinct crystallization is absent in the high grade alloys over 50 per cent, the fracture appearing fine, similar to elemental silicon, and the color bluish.

The iron-silicon alloys have been investigated quite thoroughly with the result that their properties are well understood. Tilden, Roberts Austen, and Turner commenced work with these alloys in 1887, and were followed by Hadfield in 1889, Baker in 1903, Guillet in 1904, Bisset in 1910, Paglianti in 1912, and Yensen in 1915. The metallography of the iron-silicon system has been dealt with in the scientific press by Osmond in 1890, Arnold in 1894, Baker in 1903, Gurtler and Tamman in 1905, and Gonterman in 1911. The latter co-related the work of other investigators and plotted a diagram. There is considerable dispute as to the number of iron-silicon compounds, the number being held to be from two to five. Tamman and Gurtler show but two compounds, the silicides, Fe_2Si and FeSi. R. Frilley, in Dingler's polytechnisches journal, volume 126, pages 481 to 485, announces the existence of these silicides: Fe_2Si, FeSi, $FeSi_2$, Fe_2Si_3, Fe_3Si, and Fe_5Si_3. Others point out the existence of Fe_3Si and $FeSi_3$. At least three compounds, Fe_2Si, FeSi and $FeSi_2$ exist and possibly some others.

The diagram of Tamman and Gurtler, shown in Fig. 2, indicates the existence of two eutectics; the first one contains 21.6 per cent silicon and is composed of Fe_2Si + FeSi, and the second one contains 60 per cent silicon and is composed of FeSi + Si. With less than 20 per cent silicon present, the alloys are hard and massive and consist of solid solutions of Fe and Fe_2Si. With percentages of silicon from 20 to 21.6 the alloys are composed of crystals of primary Fe_2Si embedded in a matrix of the eutectic, Fe_2Si + FeSi. When the percentage of silicon is between 21.6 and 33.3, the alloys consist of FeSi and the eutectic just mentioned. Crystals of FeSi are observed in the eutectic FeSi + Si, when the silicon ranges from 33.3 to 60 per cent. For percentages of silicon from 60 to 100, silicon crystals are found in a matrix of the eutectic, FeSi + Si.

Chemical Properties

The impurities present in electric furnace ferro-silicon are largely a function of the impurities present in the raw materials charged, hence it is important to obtain the purest materials available for charging. In the electric-furnace product, manganese is generally low ranging from 0.10 to 0.40 per cent, phosphorus from 0.01 to 0.05 per cent, sulphur from 0.01 to 0.05 per cent, and carbon from nil to 0.30 per cent. The percentages of impurities are dependent upon the grade of the alloys made, and in general, the higher the grade the lower the impurities. In blast-furnace ferro-silicon, manganese ranges from 1.25 to 2.5 per cent, phosphorus is usually less than 0.06 per cent, sulphur less than 0.05 per cent, and carbon may vary from 1 to 2 per cent. In the 25 per cent grade, calcium may be about 0.5 per cent, and it increases up to 1 per cent in the 90 per cent grade. Aluminum in most grades will be around 0.1 per cent.

Frilley has investigated the manganese-silicon alloys, both as to properties and constitution, and has shown that in this system that the following silicides are present: $SiMn_2$, SiMn, Si_2Mn, Si_2Mn_3, and $SiMn_3$. Ferro-silicon-aluminum is an alloy containing about 45 per cent silicon, 12 to 15 per cent aluminum, and the remainder iron. It is employed as a deoxidizing agent. This alloy is used mainly in steel made in the electric furnace to scavenge out oxides from the metal and produce easily fusible silicates of iron and aluminum. It is added to the liquid steel in the ladles before the metal is teemed into molds, so that any tendency toward wildness on casting will be overcome. The function of ferro-silicon-aluminum, is virtually the same as that of aluminum, but it appears to be more effective than aluminum.

Ferro-silico-manganese is made in two compositions in a French works; these are, 60 to 70 per cent manganese, 20 to 25 per cent silicon, and 3 to 4 per cent iron; and 50 to 60 per cent manganese, 22 to 25 per cent silicon, and about 19 per cent iron. The carbon in both is about 0.35 per cent, and phosphorus and sulphur are quite low. Either of these alloys

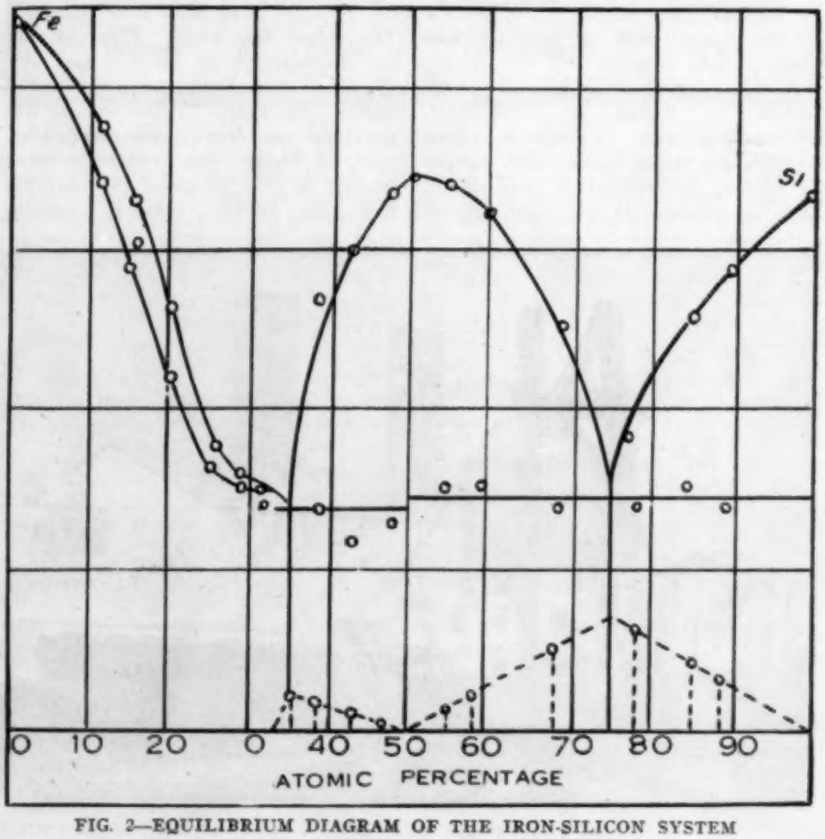

FIG. 2—EQUILIBRIUM DIAGRAM OF THE IRON-SILICON SYSTEM

is at times employed for fixed additions to liquid steel.

Ferro-silico-manganese-aluminum is made in two grades as follows: Eighteen to 20 or 9 to 11 per cent silicon, 18 to 22 or 9 to 11 per cent manganese, and 9 to 12 or 4.5 to 6 per cent aluminum. Ferro-silico-calcium-aluminum has an average composition of 50 to 55 per cent manganese, 18 to 22 per cent calcium, 12 to 15 per cent iron, 4 to 5 per cent aluminum, and about 1 per cent carbon. Its use is limited to the manufacture of high grade steels which can stand the cost. This alloy is both a deoxidizer and a desulphurizer. Silico-spiegel contains from 22 to 24 per cent silicon, and from 35 to 40 per cent manganese. It is made by melting down ferro-silicon, flint, manganese ore and carbon. As this alloy is much higher in grade than blast-furnace silico-spiegel, it finds considerable use in the metallurgy of manganese steels in works in England and Italy.

As already mentioned, the common grade of ferro-silicon, containing up to 20 per cent silicon, had been prepared for a long time by the usual reduction methods in use before the introduction of the electric furnace. The entrance of the electric furnace into the ferro-alloy field, as in many other branches of metallurgical endeavor, has effected marked departures from hitherto standard practice. The high-grade ferro-silicon, containing 50 to 80 per cent or more silicon has, at this writing, almost totally replaced the low-grade alloy for iron and steel works use The self-evident reason for this is that by the use of the rich alloy, the desired percentage of silicon can be incorporated into the metal without the risk of adding other undesirable impurities. For instance, the amount of silicon in cast iron is a cogent factor in determining its properties; so that it is extremely advantageous to be able to vary the nature of the iron at will by the silicon control.

Ferro-silicon is made by two different methods, the blast furnace and the high-temperature electric furnace. The alloy is also produced from two different charges; first, by reducing silica and iron ore with carbon, and second, by the reduction of silica with carbon, the iron addition being in the form of turnings. Although the idea of utilizing iron-silicon slags has been proposed, it has not been employed commercially, and the experiments of R. M. Keeney indicate that such a method does not appear practical.

Blast Furnace Manufacture

Ferro-silicon made in the blast-furnace stack contains 20 per cent silicon and less, the electric furnace being employed for the production of the rich alloys. In general, blast-furnace ferro-silicons contain from 10 to 20 per cent silicon, with an average of about 15 per cent. The difficulty of securing high enough temperatures in the blast furnace militates against the production of the higher grade alloys; even in making 15 per cent ferro-silicon, the fuel consumption is high.

The charge consists of iron oxide, siliceous iron ore, and coke, the reduction being effected by the carbon. Slag high in alumina and correspondingly low in lime are reputed to be desirable, as the reduction is secured more readily by their use. The furnace operation does not differ materially from the usual practice when making pig iron, but continuity of running is interrupted by furnace difficulties. Depending upon the size of the stack used, the production will vary from 25 to 100 tons.

Electric Furnace Manufacture

The early attempts to manufacture ferro-silicon in the electric furnace simultaneously with other products met with complete failure. Rathenau, Gin, Keller, Straube and others carried out pioneer work in ferro-silicon metallurgy. Straube, among other suggestions, proposed raising the silicon tenor of a low percentage alloy by either remelting it and adding a charge of quartz and carbon, or drawing it while liquid into another furnace and there adding quartz and carbon.

F. J. Tone, in an American patent, recommended the use of carborundum or siloxicon as a source of silicon for the raw material charge. Carborundum is essentially silicon carbide, SiC. The Tone patent is based upon the following formula:

$$Fe + SiC = (Fe + Si) + C$$

In modern electric-furnace practice, there are two kinds of charges which find application in the manufacture of ferro-silicon. These may be either wrought iron, steel or cast-iron turnings, quartz or sand, and charcoal, coke, or coal as a reducing agent; or silicious iron ore, quartz or sand, and charcoal, coke or coal, according to R. M. Keeney in Bulletin 77, United States bureau of mines. Iron turnings are generally preferable to iron ores, as the power consumption is less, the furnace operation is steadier, and naturally there is less slag produced. In most operating plants, the endeavor is to secure the purest raw materials available—the object in this being to avoid the introduction of slag-forming materials into the charge, and also to prevent the presence of phosphorus and sulphur in the finished alloys. The reducing action of the procedure is so powerful that most of the phosphorus and sulphur present in the charge appears in the metal, a subordinate percentage appearing in the slag.

The charge of raw materials is thoroughly mixed, and then shoveled into

TABLE I.

Analyses of Ferro-Silicon*

Kind of alloy	Si	C	Mn	P	S	Fe
English blast furnace	8.10	1.75	2.20	0.056	0.045	87.80
English blast furnace	11.50	1.50	1.35	0.058	0.030	85.50
English blast furnace	13.45	1.21	1.71	0.058	0.020	83.50
English blast furnace	17.0	0.90	1.50	0.080	0.040	80.40
Electric furnace	32.70	0.27	0.31	0.050	0.040	66.60
Electric furnace	48.70	0.09	0.13	0.040	0.030	51.0
Electric furnace	75.80	nil	0.11	0.020	0.020	24.0
Electric furnace	94.80	nil	0.08	0.010	0.020	5.10

*Foundry Trade Journal, 1907, p. 424.

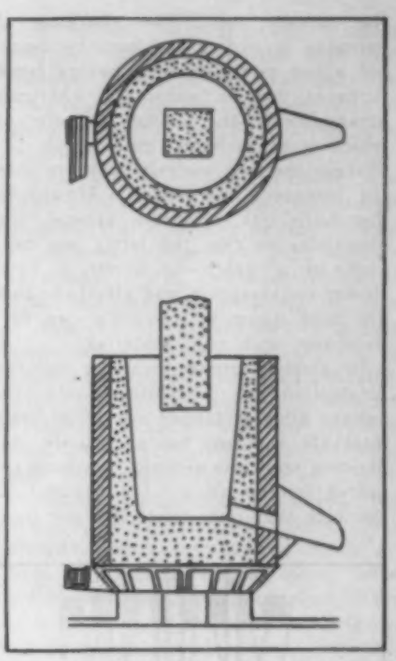

FIG. 3 — PLAN AND ELEVATION OF SIEMENS TYPE OF FERRO-SILICON FURNACE—AFTER KEENEY

the furnace top. The charging of furnaces is ordinarily done by hand, but a few establishments having large furnaces use an automatic charging arrangement, the salient feature of which is an inclined chute which discharges the raw material mixture into the furnace. The material should be distributed at intervals around the electrodes so that the latter are covered to a depth of about 1 foot. Power consumption and electrode loss are held down by covering the furnace top with cold material.

In electric-furnace practice for the production of ferro-silicon, the resultant alloy is tapped out at periodic intervals, say two hours or more, depending upon the amount of silicon required in the alloy. On account of the fact that pure materials are used for the charge, but little slag is formed. When tapped, the metal and slag are run into iron cars lined with sand or carbon, or into sand molds in the pit in front of the furnace. Because of the highly corrosive action of the metal at the pouring temperature, iron molds or ladles would have a short life, so that these are not used. After being run into the molds, the alloy is cooled, and then broken into pieces of small size for packing and transport.

Fig. 3 illustrates a plan and elevation of a Siemens type of ferro-silicon furnace. This furnace has a circular cross-section. The power is conducted by one upper electrode, as shown, and a carbon hearth. The furnace used for electric ferro-silicon manufacture cannot be lined with fire brick because of the corrosive character of the alloy. Hence, carbon is used to cover any fire bricks which may be employed. A furnace which has been put out for ferro-silicon manufacture and designed to avoid the use of a conducting hearth is shown in Fig. 4. This is a three-phase series furnace.

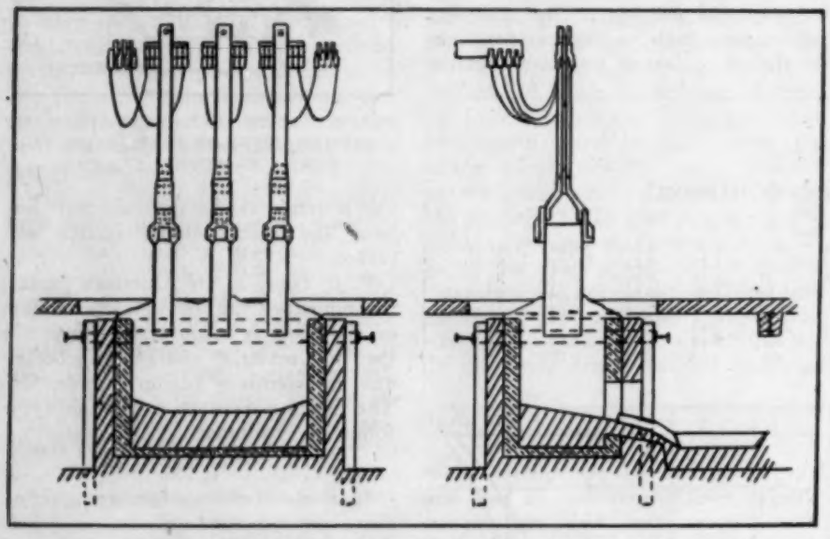

FIG. 4—ELEVATIONS OF THREE-PHASE SERIES FERRO-ALLOY FURNACE —AFTER KEENEY

Cost of Production

For commercial purposes, iron-silicon alloys made in the electric furnace are in four grades, which are graded and marketed according to their silicon content; these grades contain 25 to 30 per cent, 45 to 55 per cent, 75 to 80 per cent, and 90 to 95 per cent silicon, and higher. Dr. W. Conrad has given a table showing the cost of making 1 ton of both 25 and 50 per cent ferro-silicon at a French works. These costs are made up as shown in Table II.

Power is a considerable item of expense in all electric-furnace work, and particularly so in the United States, where the water falls have not been utilized as extensively as they have in France, Norway and Sweden. The cost of production of ferro-silicon is consequently higher in the United States than in the countries just mentioned. Where the cost may be from $25 to $50 abroad depending upon power costs, raw material sources, and grade of alloy made, in this country it will range from $40 to $65 a ton.

Installation of Plant

A ferro-silicon plant of 5,000 kilowatts capacity, which is an average size for an initial installation, will require from 8,000 to 10,000 square yards of floor space. As given by Harden, this is as follows:

	Square yards
(A) STORAGE	
Storage for quartz	2,000
Storage for coal and coke	850
Storage for scrap iron	200
Storage for sundry requirements	200
Storage for finished products	300
Storage for electrodes	150
(B) FURNACE PLANT	
Furnace room	850
Transformer room	300
Shop for electrode filling and repair shop	200
Crushing and mixing floor	300
(C) SUNDRY FLOOR SPACE	
Breaking and packing room	400
Laboratory, office, workmen's room, etc.	200
(D) SIDINGS AND FACTORY YARD	3,000
	8,950

Space should also be provided for future expansions.

The packing and transport of ferro-silicon, particularly those grades containing from 30 to 65 per cent silicon, is a matter of importance, because of the cases of poisoning which have been traced to the disintegration of the alloys. This disintegration occurs in spots in a mass of the ferro-silicon, so that part of it remains firm and hard and the rest crumbles and falls away. There appears to be considerable diversity of opinion as to whether this falling away was traceable to certain physical or chemical conditions or whether it was inherent. Keeney suggests that calcium may cause disintegration, while Frilley attributes it to aluminum. Others hold that the pouring temperature of the furnace operation and even the current density of the power line used are the causes. It seems that positive knowledge is wanting.

The gases evolved appear in many instances to be phosphine, PH_3, and arsine, AsH_3, irrespective of how they are caused. The raw materials entering into the furnace charge usually contain phosphorus in small amount at least, and the high reducing action of the manufacturing process concentrates this element in the alloy. The grinding of the pieces in transport and any exposure of the resultant powder to a humid atmosphere gives rise to the gases mentioned. Even small amounts of phosphine are highly harmful. Hence it is better practice to pack the alloy in lead or iron-lined boxes, in fact in some countries laws have been passed to this effect.

Alloys containing less than 30 per cent silicon do not exhibit the strong tendency towards spontaneous disintegration that the alloys containing from 30 to 65 per cent silicon do. The former are hard and compact, but the latter may crumble to pieces on standing. The disintegration is concommitant with the evolution of odoriferous and poisonous gases. The richer alloys, containing more than 65 per cent silicon, are somewhat hard and brittle and do not disintegrate spontaneously.

Ferro-silicon is used mainly for

the deoxidation of steel. According to Thomas Turner, it is probable that the first intentional addition of silicon to steel was made by Sir Henry Bessemer, who stated in 1861 that a small amount of silicon in steel prevented ingots from being porous or cellular. Many observations were made in the following 25 years, and in 1887 Turner arrived at some general conclusions, which for brevity may be summed up as follows: Silicon promotes soundness in ingot iron, resembling the action of carbon in producing tenacity and hardness. It should not exceed 0.15 per cent in metal which is to be rolled. About 0.3 per cent silicon is generally recommended to promote soundness in steel castings. Manganese is capable of neutralizing some of the ill effects due to silicon, and it is probable that the presence of carbon is detrimental to silicon steel.

In general, silicon produces soundness in cast steel, and is largely used in the manufacture of basic open hearth steel. The statement of Sir Robert Hadfield, that silicon up to 1.75 per cent increases the yield point and tensile strength but does not diminish the ductility, but beyond that point any increase of tenacity is accompanied by a great loss of ductility, is widely accepted.

As a Deoxidizer

Ferro-silicon, as already mentioned, is used as a deoxidizer and quieter in the metallurgy of steel; the result of the reaction is either silica or silicates with any free oxygen or oxides in the metal, the products of the reaction going to the slag. The grade containing from 25 to 30 per cent silicon is used for direct addition to the converter, open hearth, cupola, or ladle for the purpose of making fixed additions for silicon steel. The 45 to 50 per cent grade is used mainly for deoxidation of metal, and it consequently follows that more of this alloy is used than any other of the iron-silicon alloys.

The reason for the quieting action of silicon on a wild steel is twofold, as pointed out by Tone. In the first place, consideration is given to its action as a reducing and deoxidizing agent. As is well known, on adding silicon either in the form of ferro-silicon, ferro-silico-manganese, silicon carbide, etc., the silicon combines with the oxygen of occluded oxides, or with free oxygen, with the formation of SiO_2. This in turn forms fusible silicate slag with the FeO and MnO present. When added in amounts as small as 0.1 per cent it is very effective. Secondly, part of the silicon dissolves in the steel and thus causes the property of greatly augmenting its capacity for holding occluded and other gases in solution. The gases in question may include carbon monoxide, CO, carbon dioxide, CO_2, hydrogen, H, oxygen, O, and nitrogen, N. The latter three gases are of paramount importance in bessemer practice.

When added to steel baths, silicon reduces porosity and honeycombing, as well as segregation. Used in excess, it forms a large pipe in cast ingots. Ferro-silicon is of greater value in the iron foundry than in steel practice.

The properties of ferro-silicon which make it of high value in steel works practice make it of even greater value to the iron founder. The effect of silicon on cast iron has been the subject of considerable investigation particularly by A. E. Outerbridge Jr. The fact has been well established that high silicon will prevent the formation of combined carbon with the consequent production of graphite, thus giving a product with a softness only desirable for machining. Silicon is a softener by reason of its influence on carbon, and it also lessens shrinkage for the same reason.

The 10 to 18 per cent grade of ferro-silicon when added to ladles of iron does not dissolve with sufficient ease to produce much effect upon the metal. Preheating of such an alloy before adding makes for better results, but the cost of such a procedure is well-nigh prohibitive. In recent years, Outerbridge has tried out 98 per cent silicon alloys, but this proved unsatisfactory because of the high melting point and low specific gravity of the metal. A 50 per cent ferro-silicon alloy has demonstrated its effectiveness in the foundry. Its greatest practical value lies in the fact that cheaper grades of pig iron may be charged into the furnace, and also it gives absolute control of the iron produced.

Table II

Cost of Making 25 Per Cent Ferro-Silicon

1,600 pounds of scrap iron	$11.60
1,600 pounds of quartz	0.75
950 pounds of coal	1.41
110 pounds of electrodes	4.32
Wages and salaries	6.60
Repairs, maintenance, etc.	4.00
General incidentals	1.40
Total	$30.08

Cost of Making 50 Per Cent Ferro-Silicon

1,000 pounds of scrap iron	$ 6.86
6,000 pounds of quartz	2.68
3,200 pounds of coal	4.65
200 pounds of electrodes	8.00
Wages and salaries	17.20
Repairs and sundries	15.00
General incidentals	2.80
Total	$57.19

According to Thomas Baker, the effect of silicon on the mechanical properties of iron may be summarized as follows: Although the addition of silicon to iron increases its elastic limit and tenacity, such an increase is obtained at the expense of a loss in ductility. The loss in ductility, in material which has been well annealed, is quite small until the silicon reaches 3 per cent; above this, the ductility loss increases rapidly, and at 4 per cent the ductility is almost nil. With increasing percentages of silicon, the alloys increase in hardness. As already mentioned, several other alloys containing silicon have been produced for foundry purposes. These include ferro-silicon-aluminum, ferro-silicon-manganese-aluminum, ferro-silico-manganese, silico-calcium-aluminum, etc. These are employed for the purpose of rapid deoxidation and purification as they form easily fusible silicate slags. They are rather expensive for ordinary procedure.

Ferro-silicon is used also in the manufacture of silicon steels for transformer and electrical purposes. According to Bisset, it is understood that high silicon steel was quite largely used in the construction of the transatlantic liners, the MAURETANIA and the LUSITANIA. Steel producers are aware of the fact that specifications for high tensile strength can be more easily met with high silicon steels than with corresponding high carbon steels, hence high silicon steel is now furnished on specifications making high tensile demands.

A paper on "Electric Furnaces for the Production of Steel Castings," was presented at the regular monthly meeting of the Detroit Foundrymen's Association, Detroit, Mich., March 8, by W. L. Flannery, of the Ford Motor Co. Mr. Flannery's paper, which was accompanied by lantern slides, traced the history of electric furnaces and their application to the production of steel castings.

It has been stated on good authority that a new plant for the imperial munitions board is to be built in Ashbridge's bay, Canada. It is said that the plant will finally occupy 60 acres of reclaimed land, and will cost $3,000,000. It will have an initial capacity of 300 tons a day. There will be 10 six-ton three-phase, 25-cycle heroult type electric furnaces of about 2,000 horsepower each.

An Iron Girdle vs. a Belt of Gold

Germany's Aspirations are to Control the Iron Ore Reserves of the World, America Alone Possibly Excepted—Control is to Be Secured by Conquest Supplemented by Barter

BY FRANCIS MILTOUN

IRON ore is more abundant throughout the world than any other product of the earth's subsurface. The earth may be likened to a gigantic block of iron. The International Geographic Convention held at Stockholm some time ago registered the results of a world-wide inquiry which had been made by those men of all nationalities most competent, and the resulting figures with respect to iron ore deposits proved to be much of a surprise and impressionable to a high degree.

After a very serious resume it was estimated that America has known resources of 5,154,000,000 tons of metal (as distinct from ore in the ground) with Europe in the second line with 4,732,000,000 tons of metal. Asia accounted for but 260,000,000 tons, Oceania 136,000,000 tons and Africa for 125,000,000. The total resources of the world's metal, therefore, surpassed 10,407,000,000 tons.

Riches Hard to Estimate

These formidable reserves of known quantities constituted only a portion of the probable terrestrial deposits, the latter perhaps equaling 123,400,000,000 tons as a plausible estimate of a minimum to be made available under a systematic and efficient exploitation. Even so, Africa, in more ways than one, is still a dark continent and its resources are but most vaguely possible of estimation; the same is true of Asia and Oceania, of which methodical exploration even has hardly been begun. The most optimistic French metallurgists claim the mineral resources of the world are represented by the various iron ores, as 90,000,000,000 tons for American and 50,000,000,000 for Europe, with Asia, Africa and Oceania yet to be heard from.

Discoveries made in France alone since the period of these quasi-official estimates have led to the development and exploitation of the hitherto unsuspected immense basin of the western departments which may readily be supposed to add another 10, perhaps 20, billions as the outcome of the Normandy and Brittany croppings. The total for Europe thus becomes 70,000,000,000 tons.

The possession of iron ore in a region hitherto unexploited on a commercial scale is esteemed as one of the most precious gems in the crown of riches of la belle France. The French economists rightly consider iron as the base of much that goes to make up the raison d'etre in the life of a people. "It makes possible the forging of redoubtable arms of war and ammunition, to create railways for commercial expansion, endow them with an *outillage* and necessary material for their operation and to furnish the absolutely necessary material for most man-made machines, the handmaidens of labor and skill. Agriculture itself is tributary to this mechanism, and progress is only held in bounds by its expansion and development, slow or rapid." The sentiment is French, as the quotation marks show, but how true!

Leaving aside America for geographical considerations, Europe is in the main provisioned yearly in iron ore from the abundance found close at hand and drawn from the following reserves: France contributes to the extent of 4,000,000,000 tons; Germany, 3,600,000,000 tons; Great Britain, 1,300,000,000 tons; Sweden, 1,158,000,000 tons; Russia, 865,000,000 tons; Spain, 711,000,000 tons; Norway, 367,000,000 tons; Austria, 250,000,000 tons, and Luxembourg, 270,000,000 tons.

In this nomenclature, France occupies first place. Furthermore, her reserves are immense, the largest actually known of any of the producing countries of Europe. The recent exploitation of the deposits of Normandy, Brittany, the Potevin and the Massif Central of the Cevennes have proved this beyond the happiest dreams of even a generation ago. Besides these are the vast deposits which were already being worked in Lorraine before the annexation of a great part of that province to Germany as a result of the war of 1871, and the invasion of 1914, where the same deposits are now being worked under alien control and labor. The war which Germany is making is not wholly one of bloodshed; there are other elements which will prove almost as disastrous for her enemies if not checked sooner or later.

The supreme economic value of this prime material, iron ore, in its various agglomerates has ever been well known and recognized by Germany, whose ambitions in the last half century did not by any means stop with the opening and working of her own deposits. Secretly, or openly, she had a finger, and a hand, in more than one of the modern developments of iron mines in France, Luxembourg and Belgium, as well as in the coal workings in the two latter regions, though she herself was, before the war, a large shipper of coal into France from Westphalia. She paid for iron with coal mined on such favorable terms that it was cheaper, or was thought to be by the unthinking, for France to buy it rather than to mine it.

Seeking an Iron Ore Monopoly

Germany has for years pursued with tenacity her plan of absorbing these neighboring iron deposits. By the customs union which she instigated, the German empire had brought the deposits of Luxembourg into her own complete control, as she had the finance of that enigmatical country, though its speech was still French. Austria, too, was practically as much of a dependency in this respect as was the famous Skoda cannon factory a branch house of Krupp. By exceptionally favorable contracts, Germany has laid her heavy hand on the mineral resources of Sweden; her metallurgists had already begun to drain Spain and North Africa and direct the flow towards the blast furnaces of the Ruhr valley and the black country of the Rhine provinces. Germany's annexation, 40 odd years ago, of Alsace and Lorraine practically assured her of the best and most valuable resources between the basin of Paris and the Rhine, including the most productive potash deposits known.

All this richness, though, was less mourned by France than one would imagine. It was sentiment, not business, that kept the memory of the annexed provinces green in the heart of the French. The great Joeuf-Haynange iron properties, of which by far the greater part was ceded to Germany as a result of the treaty of Frankfort, caused not a tithe of the emotion of regret evoked by a single granite gateway of the fortress

of Metz which went along with it. French devotion to its monuments, to its landscape and its tradition is worth to it more than the golden calf or the golden egg. There is an echo in France today of a one-time alliance which might have been with Germany. It was in 1866 when both Germany and Austria were wooing for the hand of France as an ally in the event of a falling out between Hapsburg and Hohenzollern. Prussia, it appears, as a state owned the iron mines of Sarrebruck, worth a hundred millions, which, to cover the appearance of deceit, she was willing to cede to French interests for a paltry five million. It may have been a red herring across the trail. After events point to the fact that it was, for as the Austro-Prussian war pursued its length, the offer was seemingly withdrawn, and for the last half century there has been a notable effort on the part of Germany to secure for herself mineral resources in all parts of the world whereby she might aliment her growing metal trades.

French Iron Ore Supremacy

The development of the Angevine-Normande exploitations, in addition to those in the well-known Briey basin, furnished still another check to Germany's before-the-war aspirations in favor of the supremacy of France, but even here the celebrated Krupp-Thyssen combination were able to buy into the very heart of the organization. They even went so far as to build a seaport for shipping the ore from Normandy to Germany, which the French government was not willing to grant the credits for, though no question was raised as to the impropriety of allowing a one-time enemy to do so. This is less of a legend than armored cement tennis courts, which like the Angels of Mons are mostly myth. There is no myth about the circumstance of Germany securing large supplies of iron ore from this new French field, distant though it was from the frontier and difficult of transport. This they got on practically their own terms and paid the bill by largely supplying northern France, and to no small extent Paris itself, with coal. Iron for coal. Barter the life of trade. Gold formed no part of the transaction. It seldom does in German trade. Have you noticed it?

There is a well-developed idea in French economist circles that the underlying fundamental principle of this great world war is the commercial expansion of Germany at the expense of all its European neighbors, of all the world if you like, for trade expansion knows no geography nor natural boundaries in its curriculum. The fact that the war has spread to the four corners of the earth is apart from any theories set forth in this article, has no bearing thereon and is not even found in the text which inspired it. The French go even farther in their estimate of what happened just previous to the war; they firmly believe that the keenest commercial shaft in the quiver was aimed against them and that it was the chief tenet of the German creed that France should be ruined commercially and that as soon as possible and in a manner which would last for all time; that she should become as dead as Spain, or Chelsea. One milestone on the way was Germany's apparent desire to get France's iron ore riches away from her to begin with. The idea is perhaps an obsession of the French, but that it is based on something very real in the way of experience there is no doubt. Though it is true the French are always imagining themselves in stage-center there was certainly a spot-light of justification to begin with. It was patent that Germany should deem it her bounden duty to establish as near as might be a commercial supremacy in order to carry out her policies, incidentally to acquire iron ore deposits, at the price of blood if necessary, and thus be able to quash the siderurgical industry of England, at the same time conquering the universal markets where, indeed, Great Britain was altogether too near supremacy to please Teuton taste.

Actually the Bassin de Briey was invaded on the eve of the declaration of war according to the official chronology given out by the French authorities and by all the laws of war, at least in the eyes of the most optimistic of Germans, the richest iron ore deposits of Europe have become theirs for all time. That is the problematic status *outre-Rhin* today. Time may work changes. It is to see, to give the doubt a French locution. Briey is by no means a peace offering, indeed it may be, is, in fact, a reason for a continual *casus belli*, though non-partisans may not be able to see it with the eyes of the French until it has been pointed out.

Able to supply all Europe, which needs and will buy something like 300,000,000 tons of coal per annum, making more pig iron and more steel than any other country of the old world, Germany, in putting her hands on the iron deposits of Briey will thus increase her supplies to even greater proportions, without further development of her known resources until she has milked these others dry. When it comes to exchange again, what further she may be able to get from her exportation of her millions of tons of coal is still to be reckoned with. It will pay her better to trade thus, for the supplies are but a step away from the Rhine country where it is wanted. Germany was hardly likely to be content with three or four millions if by any reasonable chances she could get twenty millions a year and proprietorship at the same time. It was such a policy as this (put into operation, too, with respect to the linen, cotton and woolen industries of the northeastern provinces of France and Belgium) that has enabled Germany to mobilize 2,320,000,000 marks in gold and 7,260,000,000 marks of paper for whatever use she may best be able to make of them after the war. Live on the lean and hoard the fat was the policy which achieved this. It is a phase of the question which has not always been visible, but it is plain today.

Red-Herring Concessions

On such a basis Germany has mobilized and controls two-thirds of Europe's iron ore supplies in reserve and might have, may even, crush the world under her mere mass of iron. Recognizing this the allies are hardly likely to assist to a peace project which will rob France of her great Bassin de Briey, though indeed Germany make red-herring concessions in other quarters in the hope of blinding the main issue.

The economic issues of the whole universe are likely to depend upon the outcome of the European war, but it is a great question as to whether supremacy will come from an aggressive monopoly in any of the world's commodities, least of all gold or even iron.

A Shock to the Germans

The discovery of the great potential value of the famous Basin of Briey, just over the border in France, and its speedy development by French iron masters, gave a shock and a set-back to German supremacy and proved that there was no such thing for her as an unturnable corner in the world's most useful metal. Politics and business astuteness succeeded in enabling Germany to get a foothold even here by the development of a contiguous region in annexed Lorraine, and also by a subtle insinuation of alien interests into the French drift itself. The Germans for once did not figure largely enough and made their plans on the basis of sharing up a presumed production of 3,000,000 tons per annum, whereas the French actually extracted 20,000,000 tons from that portion of the exploitation which was wholly on French soil—at that time. Today part of it is in German possession and is being feverishly worked. As a war measure iron, silver or gold bullets are all the same.

The Production of Virginian Manganese

by Dr. E. A. Schubert

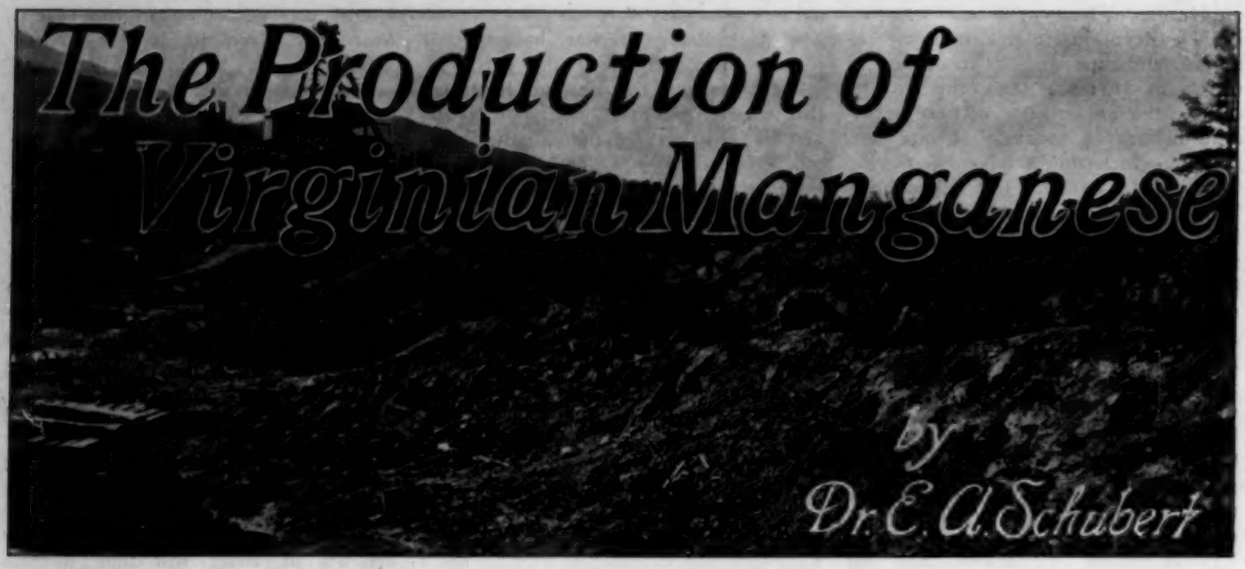

Fig. 1—Revolving Tower and Drag-Line Scraper in Transit

IN THE early eighties, Virginia produced practically all the manganese demanded by the steel industry in the United States. Not only did this state produce sufficient manganese for steel requirements, but it produced enough for all other purposes for which manganese was used. Nearly all of this ore came from the Crimora mine in Augusta county. However, after this mine had been in operation some four or five years under the supervision of the Carnegie Steel Co., litigation ensued, which, for more than 20 years, made Crimora practically a non-producer. Consequently, what manganese was mined during this period came from smaller operations in the valley foothills of the Blue ridge between the Potomac and the James rivers. For a great many years, nearly all the manganese required for chemical purposes was recovered from the several small mines throughout this valley.

It is only within the past four years that interest has centered around the manganese deposits of the Old Dominion, bringing them again into prominence, due to the conditions prevailing in the manganese market. The price of manganese ore has increased to a point where most mines may be operated at a very satisfactory profit.

Where Manganese is Found

The opinion prevails that the manganese deposits of Virginia are confined to the area indicated above. This is not correct, as there are a series of manganese leads paralleling the Blue ridge mountains in what may be termed Piedmont Virginia, extending from the North Carolina line on the south to Albemarle county on the north. The principal development centers around the present operations of the Consolidated Manganese Co. in Campbell county. There are other deposits flanking the foothills of the Allegheny mountains in the north Shenandoah valley and a few scattered pockets in almost every county of southwest Virginia.

The quality of the Virginia ore compares very favorably with that recovered from the mines of Russia, India and Brazil, providing care is taken in the grading of the product. The quantity of the ore available within the areas indicated is very large. It is impossible to estimate the tonnage because nearly all of the deposits, particularly those in the Blue ridge district are embedded in clay, the enrichment area of which is very irregular.

The old Crimora property has been purchased and reorganized by New York and Boston capitalists, and is now operated by the Crimora Manganese Corporation, 15 Broad street, New York. The company owns about 1,200 acres, the ore bearing portion of which is confined to a basin lying between the foothills and the main Blue Ridge mountain. It is at this point that the Potsdam formations have been tilted upward, forming a practically impervious basin of considerable width. It is here that the action of the elements on the archaic and granitic rocks of the Blue ridge took place. The manganese ore was leached out and was redeposited in fragments varying in size from very fine particles up to boulders weighing many hundred tons. The basin at that time was a lake or a small inland sea. After deposition ceased, the Potsdam dike was broken down; the lake or sea was drained and the deposits of ore were covered with clay, boulders and other materials to depths ranging from 5 to 100 feet.

During the time that this property was under lease to the Carnegie Steel Co., a number of small and inefficient washers were erected and the ore was recovered by open cut and tunneling over an area of seven or eight acres and to a depth ranging from 10 to 75 feet. No effort was made to recover the fines or the lean ore. The entire effort was made to recover as much of the large boulder and stratified ore as possibly could be taken out. As a result, after the expiration of some four or five years of this character of mining, several hundred thousand tons of clay, impregnated with a small percentage of manganese, surrounded the workings and the mine was left in exceedingly bad condition. This method of operation continued throughout the litigation and up to the year 1914, when the new corporation took charge.

Estimating the Deposit

The first thing undertaken by the new management was to arrive at some definite conclusion relative to the tonnage that still was in place within the basin. Consequently a number of drills were set to work and drillings were started in a systematic manner. Up to the present time about 100 drill holes have been put into the Potsdam beds. These indicate that the thickness of the ore bearing clays ranges from 150 to 275 feet. Estimates based on these figures place the ore reserve at from 7,000,000 to 9,000,000 tons.

As soon as the new management was organized, plans were made for new equipment for both the mine and

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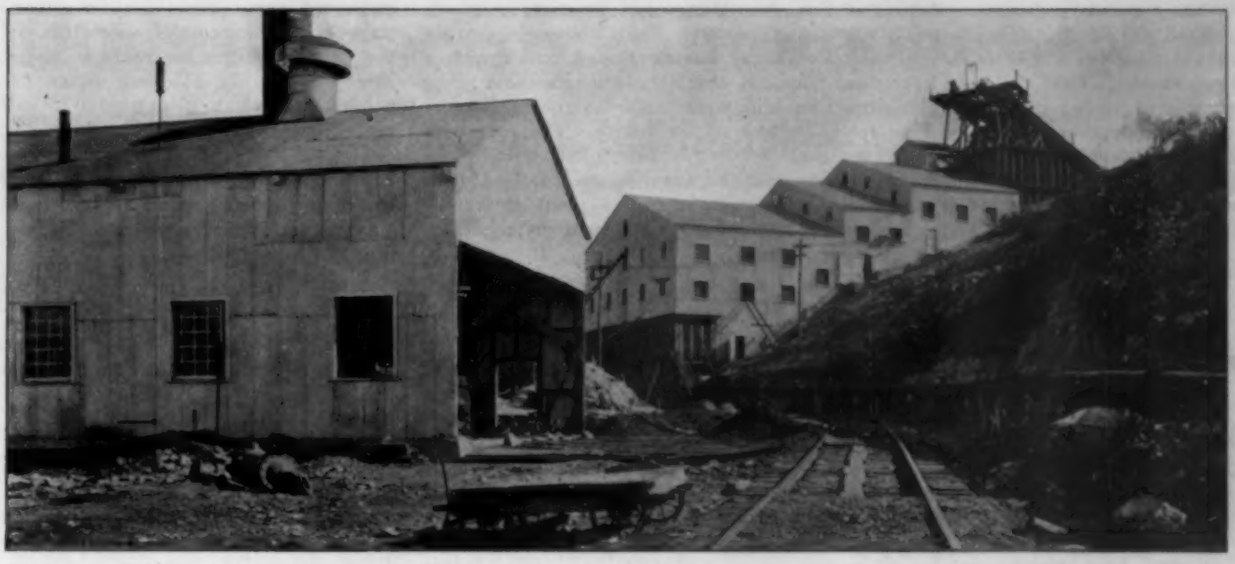


FIG. 2—SIDE VIEW OF THE MILL—POWER HOUSE IS IN THE FOREGROUND AND THE TIPPLE IS IN THE BACKGROUND

the mill. At the pit has been installed a drag line excavator with a 1½-cubic yard bucket of the "Scofield-Burkett" type. This excavator has a capacity of 125 tons of material per hour. The bucket dumps the material into a large revolving pit, having a capacity of 50 tons. From this pit the material is transported to the washer by means of two 4-cubic yard, side-dump cars, operating on an inclined gravity railway. From these cars the ore is dumped into the main storage bin at the head of the mills. The material leaving the bin passes over stationary grizzlies, spaced 3 inches apart. The fines or under-size go back into a 25-foot McLanahan stone washer; the over-size passes on to a moving grizzly, also with 3-inch spacing, and is deposited into a drag conveyor. This conveyor carries the large lumps to the slugger-roll crusher. Here the material is crushed to 3-inch pieces and is sent into the log washers, making a uniform feed of 3 inches and under. Leaving the logs, the material passes into a revolving screen, having 2-inch perforations; the under-size material passes into screen No. 2, perforations ¾-inch and 1-inch. The over-size of No. 1 screen is elevated to a picking belt where the silica and iron is removed and the clean ore goes over the belt into the ore bin. The over-size from No. 2 screen is elevated to a picking belt—No. 2 following the same process as No. 1; under-size passing into screen No. 3, which has 3/32-inch perforations. This screen acts as a slime screen and removes all of the slimes before the material is elevated to two sets of four compartment McLanahan stone jigs. The flow sheet is composed of two separate units, each side a duplicate of the other. It has been found, however, during recent plant operations, that a considerable loss of ore is entailed in No. 3 screen, therefore, an additional unit for further recovery is planned. In connection with this unit it is proposed to install a Dorr thickener by means of which approximately 60 per cent of the water may be reclaimed for further use. The solids made by the thickener will be further treated in the additional unit.

In connection with the larger washer and finishing plant, there is now under construction and practically completed a small washer and grinding unit with a capacity of 30 tons daily. Upon the completion of this unit the company will be in a position to furnish manganese dioxide ores in the various meshes required by the chemical and glass trades.

Analysis of Ore

The ore, when it leaves the main mill and is prepared for shipment to the blast furnace, has an average analysis, based upon a recent consignment of 14 carloads, as follows: Manganese, 45.22; iron, 3.70; phosphorus, 0.089; silica under 10 per cent. This analysis represents the run of the mine material as excavated by means of the power excavator.

The mill as designed and installed has a capacity for treating 1,000 tons of material every 10 hours. The plant as designed can handle over 100 tons of washed ore daily. A recent laboratory test of the material as shown up in the excavator gave an average manganese yield of 5.42 per cent. This yield has also been borne out by recent drillings covering the area tested of the known Crimora basin.

The main milling plant consists of buildings and bins, in three sections, 66 x 150 feet, in which the ore bearing material is received at a 100-foot elevation. The entire equipment is of the most modern and substantial character, all automatic, with individual electrical drives. In the power house there has been installed 500-horsepower boiler capacity, a corliss engine, generator, dynamos and auxiliary machinery. This is housed in a building, 35 x 100 feet. In addition, there has been equipped a modern machine shop, 30 x 60 feet, and other buildings.

A reservoir has been erected in the mountains having a storage capacity of 27,000,000 gallons of water. The water from this reservoir is conducted to the mill through a 6,000-foot flume line under a 140-foot head. In addition, another reservoir is now under construction with a capacity for impounding about 17,000,000 gallons of water. The mill as designed and when operating at full capacity, requires about 1,000,000 gallons of water per day. If no recovery of water were made, the reservoir capacity would insure maximum operations for nearly two months. This would extend through the most prolonged period of drouth ever experienced in that section. The refuse from the mill is conducted to the sedimentation basin which receives the mill run-off and can handle 1,5000,000 gallons of water per day. The entire equipment involves an investment of some $200,000, which, of course, does not represent the initial purchase price of the property.

This same company recently acquired control of the Kennedy mine, which is reached from Lipscomb, a small station on the Shenandoah valley division of the Norfolk & Western railroad. Here an equipment similar to the Crimora outfit has been installed.

It has a capacity of about 30 tons of washed ore daily. This material as excavated gives a yield of 7 per cent manganese. The drilling operation completed shows a considerable tonnage of ore that will analyze as follows: Manganese, 41.08; iron, 4.60; phosphorus, 0.010; silica under 10 per cent. The Kennedy mine is operated under a separate charter, and is known as the Manganese Products Co. In coupling the two operations, the company has developed mines with a capacity that should insure them being an important factor in the manganese markets of the future. The care with which the property has been prospected, the desire on part of the management to install a plant to handle the maximum amount of material at a minimum cost should insure a continuous and successful operation of the Crimora mines for years to come. The company is planning other developments which if carried out will go a long ways toward making the American iron and steel industry independent of foreign manganese ores. Under the existing conditions such an arrangement is highly desirable.

A Uniform Cost System for Foundries

TO PROMOTE the adoption of a uniform system of foundry cost accounting among its members, the American Foundrymen's Association has outlined a plan of procedure which represents the most comprehensive effort in this line of endeavor that has ever been undertaken by a cooperative body. For some years this organization has had cost committees at work which have presented valuable reports at the annual meetings of this society, but unfortunately a large part of this work has been without practical results owing to the fact that the members, in only a few instances, have followed the recommendations made.

To make this work more practical and to facilitate the installation of uniform cost-keeping methods in the plants of the members of this association, it has been decided to provide them with the personal service of a cost expert whose duty it will be to make the existing cost systems conform to the one that is to be adopted. Without the services of a cost accountant to introduce the system, no headway can be made toward uniformity of practice, which is the underlying basis for intelligent estimating among competitors.

Since the American Foundrymen's Association, due to its low cost of membership, is without means to carry on this special work, it was decided to raise a fund by subscription among those who desire to participate in the benefits to be derived from this undertaking. The plan will enable foundrymen to obtain a cost accounting system at a nominal cost, which will be representative of the latest and best practice in cost-keeping methods.

Productive labor is a good measure of the value of the business transacted by a foundry and, therefore, the expense of this undertaking will be pro-rated on the basis of the number of molders and coremakers employed. The schedule of charges that will apply, follow: Foundries employing up to 40 molders and coremakers, $50; from 40 to 200 molders and coremakers, $1.25 for each molder and coremaker employed; for plants employing more than 200 molders and coremakers a flat charge of $250 will be made. Since additional traveling expenses will be involved in the installation of the system outside of the industrial centers of the United States and Canada, an extra charge will be made for this service west of the Mississippi river, south of the Ohio river and outside of the Province of Ontario, in Canada.

Payments are to be made on the following basis: Twenty-five per cent when subscribing to this special fund; 25 per cent upon the receipt of the book containing the uniform cost system; 25 per cent after the system has been installed by the cost expert and the remaining 25 per cent after the subscriber has received from the cost accountant a written report covering the system in use with suggestions to make it conform to the uniform method to be adopted.

To carry on this work, the cost committee of the American Foundrymen's Association has engaged the services of C. E. Knoeppel & Co., New York, industrial engineers and cost accountants. Data are now being gathered preparatory to the compilation of a uniform system of cost-keeping for foundries, which can be adapted to shops specializing in the manufacture of gray or malleable iron, or steel castings. The problems of the foundry which is a department of a manufacturing plant and produces no castings for the trade will be considered and provision also will be made for specialty, light and heavy work shops.

When the uniform system has been ratified by the cost committee, it will be printed in pamphlet form and will be distributed among all of the subscribers. As soon as possible thereafter, cost experts in the employ of C. E. Knoeppel & Co. will visit each one of the plants of the subscribers and will point out the features of the cost system and will aid in its installation. This personal visit will be followed by a written report by the cost expert who will detail every step to be followed in the introduction and use of this system. For a reasonable time thereafter, the advice of C. E. Knoeppel & Co. can be had by correspondence without additional cost to the subscriber.

Subscribers to this fund are limited to the membership of the American Foundrymen's Association, but foundries not so enrolled can derive the benefit of this great work by becoming members of this organization.

Furthermore, only subscribers to this special fund will receive a copy of the uniform cost system and the services of C. E. Knoeppel & Co., membership in the American Foundrymen's Association alone not entitling those so enrolled to participate.

Favorable replies already have been received from 217 members of this organization in the United States and Canada, and 51 have forwarded their subscriptions. This is sufficient assurance that the plan can be carried to a successful conclusion and it marks the beginning of the greatest uniform cost campaign ever undertaken in a single industry.

The members of the cost committee who conceived this undertaking follow: B. D. Fuller, chairman, Westinghouse Electric & Mfg. Co., Cleveland; H. J. Koch, Fort Pitt Steel Casting Co., McKeesport, Pa.; J. Roy Tanner, Pittsburgh Valve Foundry & Construction Co., Pittsburgh; C. R. Messinger, Sivyer Steel Casting Co., Milwaukee, and A. O. Backert, secretary, Twelfth and Chestnut streets, Cleveland.

The Julius King Optical Co., New York, has been awarded the Louis Livingston Seaman medal for the year 1916 by the American Museum of Safety. This medal was awarded for "progress and achievement in the promotion of hygiene and the mitigation of occupational disease". The award was based on the Julius King Optical Co.'s efforts in the production of a scientifically correct color scheme for lenses in goggles worn by workmen exposed to the intense glare in arc welding and other metallurgical operations.

How to Specify Automobile Steel

A Description of the Manufacture of Sheet and Strip Steel for Automobiles, and Suggestions as to How Engineers Can Purchase These Materials Intelligently and Economically

BY F. WALTER GUIBERT

SHEET and strip steel for automobiles probably constitute the most difficult of all the products of a rolling mill for the automobile engineer to specify. It is most important that the sheet or strip maker shall know exactly what is wanted and needed, and that the articles shall be purchased at the least expense to the buyer.

The sheet steels used in the manufacture of automobiles run the gamut of the tempers and finishes produced by a sheet mill, and beginning with the lower finished, we have in their order, light-gage plate, blue-annealed sheets, hot-rolled box annealed, one-pass cold-rolled box annealed and three-pass cold-rolled box annealed sheets; and then come what are termed the automobile sheets. Cold-rolled stock is necessarily the product of a merchant sheet mill to distinguish it from the product of a jobbing mill. A jobbing mill produces light-gage plate and blue-annealed sheets, the latter name being used because the sheet carries a heavy blue scale, due to annealing in an open furnace and cooling in the air. The product of the merchant sheet mill is annealed by placing the sheets in large boxes, either cast iron, cast steel or wrought steel, tightly sealed, and keeping them in a soaking heat for several days. Contrary to the general understanding, light-gage sheets are rolled transversely from a sheet bar, whereas the blue-annealed sheets of a jobbing mill are the result of a continued reduction in the same direction on the slab in the same heating.

Manufacturing Sheets

Sheet bars come in lengths of 30 to 40 feet and are always 8 inches wide. The thickness is the controlling factor and varies according to the length of the finished sheet desired. The bars are rolled from a bloom on either a universal mill or a sheet-bar mill and are delivered to the sheet mill cold, where they are cut into small lengths to correspond with the width of the sheet ordered, and are rolled transversely across the 8-inch face. A sheet ordered number 20 gage, 30 x 120 inches, would require a sheet bar 30 inches long, to correspond with the sheet width, and of sufficient thickness that when rolled out to 120 inches in length, it will be just number 20 gage. Therefore, the sheet bar required would be ⅜ inch thick. These bars are heated in furnaces to a temperature where the scale starts to raise; then they are drawn in pairs from the furnace and passed singly through the hot-rolls the 8-inch way of the bar. Five passes are usually given the bars, and they are then paired and reheated for further reduction. For the lighter gages, these pairs are doubled upon themselves, making four sheets in a pack, and are rolled to gage.

Nomenclature of Sheets

The necessity of hot-rolling these sheets doubled or double-doubled is due to the impracticability of rolling light-gage sheets singly through the hot rolls, owing to the spring of the rolls, the rapidity of the cooling of the sheet, and the small tonnage produced. The hot rolls are turned up slightly concave when cold, to make allowance for the expansion caused by the heat during rolling.

After the sheets are hot-rolled to gage, they are trimmed and given one pass through the cold rolls and are then annealed. These sheets form the basis of the product of a merchant sheet mill and are called one-pass cold-rolled box-annealed sheets. The other names under which they are known are black sheets, black iron, sheet steel, box-annealed sheets, and sheet iron. The base gage for computing differentials is always number 28. The base sizes in number 28 gage are between 24 inches and 32 inches wide, inclusive, and 60 to 132 inches in length, and no extras apply on any intermediate sizes. One-pass sheets, when sold as such, may be either bessemer or open hearth steel, and the allowable variations in gage and weight is that adopted by act of the United States congress, March 3, 1893, which is as follows: Number 17 gage and lighter, 2.5 per cent in gage; and number 16 and heavier, 5.0 per cent in gage.

The allowable variation in width is ¼ inch and in length 1 inch. The differentials and extras for sizes, gages, finished, quantities and qualities are unusually standard with all mills and lists are easily obtainable. The three-pass cold-rolled box-annealed sheets are the same as the one-pass cold-rolled box-annealed sheets, with the addition of two extra passes through the cold rolls, which gives them a slightly better surface.

There are very few mills in this country which have been able to successfully produce automobile sheets on a commercially profitable basis, due to the exaction of the automobile manufacturer. Even these few always produce, among their primes, large quantities of seconds and wasters, so that it has become necessary to insist that the purchaser of automobile sheets absorb a portion of these seconds up to 15 per cent of the quantity of primes, making a fair reduction in price for the seconds.

Sheets for automobiles are divided into three classifications, each of which has its further classifications. The first is body stock; the second, hood, splash guard, flat fender, apron and door stock and the third, crown fender, cowl and radiator-casing stock. The further subdivisions of each of these classifications consist in tempers and analyses.

Classification of Sheets

Automobile sheets are manufactured much in the same manner as the one-pass sheet with, however, many added operations, and each mill has its own method of arriving at results. The usual method calls for a particular analysis of steel. The sheet bars are pickled before hot rolling, and the product is given other picklings and annealings, together with the necessary cold rollings to produce the various finishes and tempers required. Extreme care is necessary at all times to produce the various finishes and tempers required. Extreme care is necessary at all times to avoid the many defects which arise in the manufacture of high-surfaced sheets such as chatter marks, cold-rolled marks, corner marks, pits, ripples, buckles, furnace scale, scratches, etc. Rolling steel cold increases the elastic limit and ultimate strength and decreases the ductility. It is necessary, therefore, after rolling sheets cold to anneal them. Otherwise, continued cold rolling will harden them until they become flowered and cracked, so that the number of passes or amount of reduction without annealing is limited. The temper is obtained by cold rolling, and a properly annealed sheet being dead soft is hardened or stiffened by means of cold rolling, hammering or drawing.

Body sheets are classed as bright

From a paper given before the Steel Treating Research Club, Detroit. The author is with the Massillon Rolling Mills Co., Massillon, O.

finish and dull or velvet finish sheets. These are sub-classed again into standard stamping or drawing quality, deep-drawing quality, and extra-deep drawing quality. The bright finish is a high glossy surface intended for japanning or enameling. The velvet or dull finish is intended for hand coating, and the surface is more or less open to hold the painting operation, such as priming, rough stuffing, and enameling that requires no baking. In these divisions the deep-drawing quality is necessary for jobs on which shallow drawing or forming is necessary. Back and side panels are usually ordered in this quality. The extra-deep drawing quality, however, is a special analysis and treated sheet produced for difficult and severe drawing operations, such as a wheel house, seat backs, etc.

Hood, splash guard, flat fender, apron and door stock carries a higher finish than the standard body stock, due to the fact that it is to be japanned or enameled. The primes should be suitable for a two-coat japan finish and the second for a three-coat finish. This sheet is closer surfaced than the body stock and is not expected to stand any particular bending or drawing. It should be ordered only for comparatively flat work. Deep-drawing and extra-deep drawing qualities should be ordered for jobs requiring stamping, rolling, forming or drawing.

Crown fender, cowl and radiator-casing stock carries a high surface, also suitable for two-coat japan finishes and at the same time permits of drawing without opening the surface. If the job is an exceedingly difficult draw, the steel should be ordered in the deep-drawing or extra-deep quality from the point of economy in production. It has been found that after the draw, this steel is apt to show drawing or stretcher strains which are visible streaks consisting of a series of depressions or worm marks due to the inequality of the plastic condition of the surface and the interior of the sheet. This is due to the cold rolling and subsequent annealing.

Table I

Physical Properties of Cold Rolled Sheet Steel

Kind of stock.	Sclerescope hardness	Elastic limit pounds	Ultimate strength pounds	Elongation in 2 in. per cent	Reduction of area per cent
Hood and flat fender stock..	31	77,000	86,000	6.0	42.0
Body stock	29	74,000	81,000	10.0	46.0
Pickled and annealed one-pass stock	27	55,000	74,000	19.0	55.0
One-pass cold-rolled pickled and annealed	26	40,000	68,000	24.0	62.0
Hot-rolled annealed	24	31,200	59,000	29.0	67.0

Roller and Stretcher Levelling

After the sheets for automobiles have been finished and annealed satisfactorily they are passed through a series of small rolls called roller levelers, for the purpose of eliminating whatever buckle may remain in a sheet. However, if an absolutely flat sheet is required, these should be ordered stretcher or patent levelled. This process consists of fastening both ends in a drawing bed and by means of hydraulic pressures stretching the sheets until they are absolutely flat. It is usually not necessary to order stretcher-levelled sheets where a die-drawing operation is used, as the draw usually absorbs the slight buckles that might remain after roller levelling; but where a flat, highly finished surface is necessary, stretcher levelling is recommended. In many cases, simply as a precaution it is most economical to have highly finished sheets oiled. This costs but little extra and assists in prevention of rust during transportation, storing, handling, and manufacture of parts. Condensation of the atmosphere in a freight car is bound to occur, and few cars have roofs which are rain or snow proof. Most storing spaces for sheets are damp or not of the same temperature as the steel when being stored, which also causes condensation. Perspiration and hand marks as well as scratching in handling are largely avoided when the sheets are properly oiled; and it is best to carry this oil on the sheet through manufacture until the part is ready for enameling or priming, when the oil may be readily removed by gasoline. A scratch requires a lot of work to undo, and the labor cure is much more expensive than the oil prevention.

If it is necessary to have sheets square on all four corners, they must be ordered resquared. Otherwise the usual variation of 1 inch in length and ¼ inch in width must be allowed. Unless highly finished sheets are ordered in carload lots they should be crated, as they will be absolutely ruined in transportation and neither the shipper nor carrier will guarantee against damage.

Sheets should be specified under the division to which they belong, and it is usually best to state to the mill just what the sheets are to be used for, and whether it is a painted, enameled, or nickel-plated job. Always order, if possible, in the base sizes in order to eliminate the size extras. As most automobile sheets are numbers 19, 20, 21 and 22 gage, the corresponding base widths are between 24 and 36 inches inclusive, and the length from 60 to 132 inches inclusive. Fractional sizes within these limits may be ordered without extra cost. Narrower or wider, shorter or longer sizes carry extras. Numbers 17 and 18 may be ordered from 20 to 36 inches in length without extra cost. It is best to confine the maximum width to 36 inches and maximum length to 120 inches if possible, and preferably between 24 and 30 inches in width and from 60 to 96 inches in length, as the best possible surfaces can be produced in these sizes. There should be no hesitation in paying the deep-drawing or extra-deep drawing differentials for difficult jobs, as the loss in manufacture and production usually amounts to more than the higher quality of sheet could have cost. Sheets should be ordered by United States standard gage and not by thousandths of an inch.

Each mill has its particular analysis for the different steels in making sheets, but the tempers are always obtained by the cold rolling and the amount of screw

Table II

Physical Properties of Cold Rolled Strip Steel

Temper	Yield point pounds	Maximum load pounds	Yield point pounds per square inch	Tensile strength pounds per square inch	Elongation in 2 inches	Elongation Per cent	Reduction of area per cent
A	10,500	10,900	85,860	89,120	0.08	4.0	46.3
A	10,400	10,900	85,040	89,120	0.10	5.0	46.3
B	5,900	6,300	63,790	68,110	0.38	19.0	47.2
B	5,950	6,250	63,160	66,350	0.35	17.5	58.3
C	5,800	6,100	53,160	55,910	0.78	39.0	70.2
C	5,650	5,860	52,500	54,460	0.79	39.5	67.9
D	3,950	5,800	33,030	48,500	1.04	52.0	72.7
D	3,900	5,650	32,660	47,320	1.06	53.0	73.0
E	4,050	5,700	33,110	46,600	1.02	51.0	73.7
E	3,850	5,750	31,120	46,480	1.12	56.0	67.3

on the cold rolls. However, the methods of reduction and treatment in operation are as essential as the analysis in producing satisfactory results. The standard analysis for auto parts is substantially as follows: Carbon, 0.08 to 0.15 per cent; manganese, 0.35 to 0.50 per cent; phosphorus, less than 0.04 per cent; and sulphur, less than 0.04 per cent. For extra-deep drawing purposes the steel should approximate the following analysis: Carbon, 0.12 per cent; manganese, 0.40 per cent; phosphorus, 0.03 per cent; and sulphur, 0.04 per cent.

The physical properties of cold-rolled sheet steel are given in Table I.

Undoubtedly all sheets for automobiles will be made of alloy steel at some future time, not only for the purpose of reducing weight but for the increased strength desired in certain parts. Frames and stamped connecting rods are already under discussion, and who knows but what some enterprising engineer will develop a sheet-steel fender which will not crumple up under the slightest blow or a body which will stand a good thump without showing a dent and ruining the whole appearance of the car.

Differing radically from sheet steel, the manufacture of cold-rolled strip steel entails a continued rolling of the product of a hoop or band mill. The steel is reduced cold and is never cross rolled. The billets, being reduced in the hoop or band mill to hot-rolled strips, are delivered usually in coils to the cold roller. Here they are pickled to remove all scale, and by successive passes through the cold rolls reduced to the gage desired. Sufficient thickness of steel, however, must be used so that the cold rolls polish and fill the more or less open surfaces of the hot-rolled band or hoop during reduction; and the finished strip should have a surface suitable for nickel plating without further polishing. It is usually necessary to anneal between the reductions in cold rollings and contrary to the usual opinion, the temper is obtained, not by annealing, but by cold rolling after annealing, and it is here where the art of the strip maker reaches its pinnacle.

The scleroscope hardness of the five different tempers produced is as follows: Dead soft, 18-20; soft, 20-22; medium soft, 24-26; bright rolled or half hard, 32-35; full hard, 38-40. All of these tempers are obtained by cold rolling.

When thoroughly annealed, the strip is dead soft, and can be used for the most difficult of deep drawings. It is very much better than sheet steel for drawing purposes, due to the fact that it has been reduced cold and has not been cross rolled. The soft temper is for ordinary bends and easy draws, and in which a certain amount of stiffness is desired in the finished article. The medium soft is intended for a stamping which will stand a right angle bend across the grain, fairly well with the grain, and has a certain amount of spring.

Cold-rolled strip steel should always be specified in thousandths of an inch or by Birmingham or Stubbs gage and never by United States standard, Washburn and Moen, or Brown and Sharpe. As strip steel may be furnished, either sheared or mill edge, it is best, where stripper dies are used, to employ the sheared edge for accuracy, inasmuch as there is a certain bulging on the side of the strip. However, the sheared edge may carry a slight burr from the slitting. When ordering steel for shims, which may be rolled as thin as one thousandths of an inch, shim stock should always be specified, as this should be given some cold rolling after annealing.

The extras and differentials for cold-rolled strip steel are very intricate, and it is usually best to call in the strip salesman when prices are to be figured, inasmuch as the base price is on coils, hard temper, 1½ inch and wider, by 0.100 inch and thicker, in 50 tons or more quantity. One can realize that the variations from the above base are numerous. There are extras for thickness; extras for temper; extras for straightening and cutting, extras for special widths; extras boxing; and extras for quantity; and these lists are easily obtainable, and the engineer should consult them before specifying.

The standard analysis for soft steel is used in strip, but special analysis is often necessary, particularly as regards the carbon content for such parts as brake bands, friction discs, etc. The allowable variation in gage and width and length is as follows: One to two thousandths over or under in thickness and on slit edge stock, 1/64 inch wider or narrower and mill or round edge, ⅛ inch over. The physical properties of cold-rolled strip steel are given in Table II.

GANTRY CRANE FOR COAL HANDLING AT PORTO RICO PORT

Coal Handling Crane for Porto Rico

The accompanying illustration shows a gantry crane installed at the San Juan coaling station of the Porto Rico Coal Co. by the Cleveland Crane & Engineering Co., Wickliffe, O. The span of the gantry crane is 127 feet and the hinged cantilever is 95 feet long. The trolley track

is 48 feet above the dock level and has a gage of 8 feet. The trolley wheels each are 20 inches in diameter and 14 feet 3 inches, center to center, and are geared to the trolley motor. The maximum load on each wheel is 10,000 pounds. The trolley motor provides for acceleration from rest to a speed of 800 feet per minute and the hoisting mechanism is designed for a speed of 300 feet per minute and a capacity of 180 tons of coal per hour. This rating is based upon the use of a 3½-yard Hayward clam-shell bucket for taking coal from boats and depositing it at the center of the span.

The mechanism for raising the cantilever is housed on top of the main girder and operated from a cage under the hinge point. All movements of the crane are controled from this point. Coal may be loaded direct into railroad cars from the crane by means of a suspended hopper and two swinging spouts which travel over the tracks. The hopper has a capacity of 12 tons of coal. For fueling boats a portable hopper with telescopic spout rigged up on the cantilever so as to reach the fueling chute in the sides of passenger and other boats is provided. The frequency with which heavy storms and hurricanes occur in the West Indies made it necessary to design the crane structure to carry a wind load of 50 pounds per square foot of exposed area. The main trucks have a wheel base of 12 feet and are spaced 40 feet, center to center. Each truck is equipped with an automatic rail-clamping device which can be released by the operator from the cage when the gantry is to be moved. The electrical equipment consists of three motors on the trolley, two on the bridge and one on the cantilever, all designed for 60-cycle, 3-phase, 440-volt current, which is furnished by a local power company.

The hoist motors are equipped with automatic electric brakes for sustaining the load in any position. Regenerative control is employed during that part of the cycle when the load is being lowered. This arrangement eliminates the mechanical or load brake from the hoisting mechanism and controls the speed of the descending load electrically.

Is the German Steel Output Declining?

AN editorial recently published in *The Ironmonger* points out several significant facts leading to the belief that Germany is facing a shortage in steel. This claim is based chiefly on the fact that the Association of German Iron and Steel Masters has for the past three months failed to publish output figures. Previous to this time the association had always been noted for the promptness and accuracy of its steel and pig iron statistics.

The only previous interruption to the flow of statistics occurred upon the advent of the war in 1914, but only for a month or two. When it was resumed in the early autumn it was found that there had been a sudden and remarkable decline in the first month of the war, followed almost immediately afterward by an almost equally noteworthy improvement. In round figures, the monthly production of steel in Germany and Luxemburg before the war was 1,500,000 tons. In the first two months of the war it averaged just over 600,000 tons monthly. By March, 1915, it had crept up to 1,000,000 tons, while the latter half of 1916 showed it to have risen to 1,400,000 tons monthly, or barely 6 per cent behind the peace record. Pig iron followed an almost precisely similar course.

The Ironmonger takes the stand that there has been an all-around decline in the production of pig iron, steel and all manufactured materials, and that the publication of figures registering this decline would have an extremely depressing influence upon the German public. It may be that Hindenburg's mass levy of citizens is unable to make good the labor power withdrawn by the calling up of Germany's last reserves, or that underfeeding is beginning to tell, but, whatever the cause, there is hardly room for doubt that if the German works were still increasing their production, the statistics would continue to be published. In connection with this suppression of the steel statistics, it is worth while to quote the Essen correspondent of the Dutch technical journal *Yzer en Staalkroniek*. This is a paper of good repute but its circulation is necessarily limited to Holland, and there is no reason for assuming that the report was written to mislead the enemies of Germany. The correspondent says:

"Speaking generally, the iron and steel industry of the Rhine Province and Westphalia is unable to cope with the gigantic demands made of it, although it must be admitted that during the war this industry has certainly produced wonderful results. Taking into consideration the scarcity of raw materials, such as certain varieties of ore and of accessories, oil, for example, the scarcity of rolling stock and, as a result of this, the frequent lack of fuel, the productive capacity has been carried to an extremely high point. The scarcity of rolling stock has been very seriously felt lately.

"Another adverse influence is caused by the labor problems. The food rations are insufficient for those who have to live by them alone. It is found in practice that money will still buy all sorts of food, but only at famine prices. As the rations are insufficient for a person of normal appetite, it is certain that the quantity allowed is not enough to enable a factory-worker to recuperate his strength on them, especially in view of the quality of the food. Hence extra rations are allowed to men and women who do heavy industrial work. But, evidently, with these extras the rations are still insufficient, apart from the fact that lately it has been impossible to supply the extra amounts. As a result, the producing power of the workers upon which so much depends is falling off and the output of plants is affected.

"Thereupon strikes ensued, with the double object of securing more food and higher wages. In mining, such strikes have long been familiar, but they have never before led to a stoppage of work on a large scale. Recently similar occurrences have been noticeable in the iron industry, especially in the large munition works. Here also timely measures have averted a general strike, but the discontent continues and secret meetings of workers belonging to separate departments and shops are of daily occurrence.

"The effect of all this is very harmful, the more so because it is clear that at the present time extraordinarily much depends upon the productive capacity of the industry. At Essen, the firm of Krupps and the municipal authorities have found themselves compelled to address urgent petitions to the government, and both have again caused statements to be published promising improvement and pointing out that before long the supply of potatoes will become more regular, and that large quantities of other foodstuffs have been allotted by the government to this important industrial district."

New Chicago Electric Steel Works

Description of a Plant Equipped With a 1¼-Ton Heroult Furnace—Ingots Six Inches Square and Five Feet Long are Cast—Forging Equipment Being Installed

BY GEORGE H. MANLOVE

CONSIDERABLE dislocation of the alloy steel industry in this country has resulted from the demands of 32 months of warfare in Europe. The rapid expansion of machine shop activities in 1915 created a shortage of tool steels, which was met at first largely by the efforts of manufacturers of alloy steel castings and forgings. This simply transferred the shortage from one department of the industry to another. As a result, the special steel situation has been critical for months.

The misalignment is now being corrected, however, through the construction of new plants for the production of alloy steel specialties. One of the latest plants of this character to be placed in operation is that of the Trojan Electric Steel Co., Chicago. This concern has installed a 1¼-ton heroult electric furnace, which has been producing special steels for several weeks. The works is located at Thirty-fourth street and Hoyne avenue, Chicago.

The output up to this time has consisted only of 6x6-inch ingots. The various products include nickel, chrome, chrome-vanadium and high-carbon tool steel. These have been most in demand but it is possible for steel of any desired analysis to be made to suit the consumer. The company's market has been restricted to buyers who can forge ingots to smaller section before using the steel for tools and other purposes. At present a 2,000-pound steam hammer and oil heating furnaces are being installed and in future billets will be forged to bars of various sizes. This will enlarge the field by promoting sales to smaller concerns not possessed of facilities for forging.

The heroult furnace is operated by central-station current. The leads are carried to the plant in conduits, avoiding line trouble and danger from lightning and other disturbances. The current is transmitted at 12,000 volts and by means of Westinghouse transformers is stepped down to 110 volts. The transformers and control apparatus handling the high tension current are housed in an enclosed room to avoid danger.

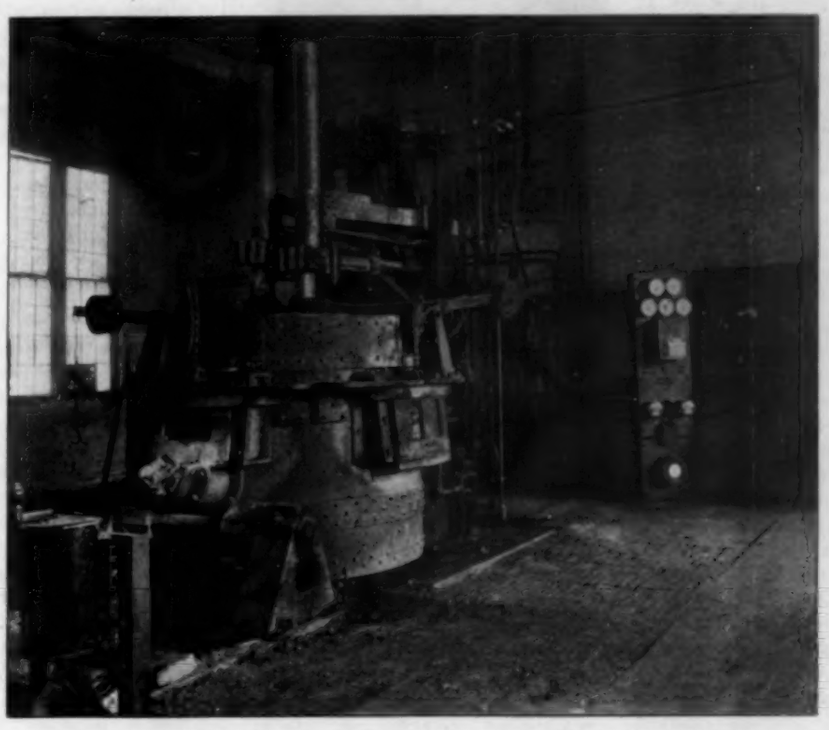
The furnace charge consists of 2,400 pounds of steel scrap carrying about 0.025 per cent phosphorus and 0.04 per cent sulphur, 250 pounds of lime and 10 pounds of fluorspar. This is melted and continued under the arc for about two hours, the slag removing the phosphorus. At the end of this period the furnace is tilted and the slag is raked off until the bath is clean.

At this time additions are made containing the proper quantity of whatever alloy is needed and in the case of high-carbon steel, carbon is added by introducing bessemer pig iron, the quantity varying according to the needs of the steel as determined by an analysis. Lime, coke and spar are added to form a calcium-carbide slag and the process is continued a second period of two hours.

All additions are made in the furnace, which gives a homogeneous mixture, the alloying being completed in the two hours under the final slag. This method has advantages over making additions in the ladle, as in such cases the mixture may be only partially accomplished and segregation is likely to result.

When the final refining has been completed, the metal and slag are poured into a bottom-pour ladle and carried by a crane to the casting pit, which is near the furnace. The ingot molds are 6x6 inches in sections and about 5 feet long. The pouring aperture in the ladle is 1 inch in diameter, thus filling the mold slowly and reducing piping to a minimum. In actual practice it is found necessary to discard only a small portion of the top of the bloom or ingot.

It is customary in this plant to make two heats one day and three the next. Starting the week by charging and melting two heats, the second is poured sufficiently early to allow charging in preparation for the first heat of the following day. This gives an early start in melting and three heats are made, the third being poured too late to permit recharging for the following day. In practice somewhat in excess of the rated capacity of the furnace is obtained and the average production ranges from three to four tons per day. In the accompanying illustration the furnace is shown, with the controller operating the tilting mechanism in the foreground and the switchboard panel in the background. Typical analyses of the finished product follow—Nickel steel: Carbon, 0.25 per cent; sulphur, 0.021 per cent; phosphorus, 0.019 per cent; silicon,



A 1¼-TON HEROULT FURNACE AT PLANT OF THE TROJAN COMPANY

silicon, 0.12 per cent; manganese, 0.38 per cent, and nickel, 3.41 per cent. High carbon tool steel: Carbon, 0.94 per cent; manganese, 0.42 per cent; sulphur, 0.025 per cent, and phosphorus, 0.019 per cent.

The officers of the Trojan Electric Steel Co. include Walter E. Hadley, president; C. C. Lilly, vice president, and Eugene C. Lilly, secretary-treasurer.

Conducts Torsional Test

An interesting test was recently conducted by the National Tube Co., Pittsburgh, in order to determine the strength of a piece of 8-inch pipe. A torsional stress of 713,000-inch pounds was applied to the pipe. The manner in which the pipe stood the test is shown in the accompanying illustration. Eight-inch pipe weighs approximately 29 pounds per foot and the wall is about one-third of an inch thick.

Not the Largest French Plant

A French correspondent of *The Iron Trade Review* has submitted a communication regarding the article on welfare work at the Schneider plant, which, on account of its interest and information, is published in its entirety. The letter follows:

"Dear Mr. Editor:

"In your issue dated March 8, 1917, you publish very interesting particulars concerning the 'Welfare Work at l'Etablissement Schneider'. However, it would perhaps not have been quite superfluous to mention that, up to the present war, the Schneider & Co. directors were not alone in France to take such a paternal care for their workmen and their families. To the honor of practically the whole of the French ironmasters, such welfare institutions were quite general in this country, and chiefly in the iron districts of Lorraine.

"But you made a material mistake that is very common all the world over, when saying that the Etablissements Schneider are the largest steel plants in France. The yearly statistics of the French 'Comite des Forges' (a trade association embodying the whole of the iron, steel and machinery concerns in France, and that compares pretty well to the German 'Stahlwerksverband') set out this fact that, in 1913, Messrs. Schneider & Co. were only:

"The tenth makers of pig iron in France.

"The seventh makers of steel.

"The twenty-fifth or twenty-sixth producers of ironstone.

"The third in the production of girders, joists, etc.

"The eighth for rails, etc.

"Even in the United Kingdom, a Frenchman is always struck when finding that so few men in the iron and steel business are aware of the exact position the Creusot company holds in the French industry.

"As a matter of fact, the Creusot works is among the oldest 'forges' in France; it makes practically every line in the iron, steel, machinery and ship building business; in school books the Creusot concern is always mentioned. When somebody wishes to get a good fair idea of what metallurgy really is, a visit of those very important works satisfies his curiosity. Besides, the Creusot company has

RESULT OF A TORSIONAL STRESS OF 713,000 INCH POUNDS ON AN 8-INCH PIPE

been, for so many years, a prominent maker of war materials that the man-in-the-street, in France and elsewhere, has been induced to believe, quite wrongly, that the whole of the French army ammunition was made by that company.

"But, even in that peculiar business of war material, the Schneider works are neither the only nor the most important maker. Up to the present war, practically the whole of the French artillery material was made in the French government ammunition factories, and we had in this country at least three big armament and artillery makers: Messrs. Schneider & Co. (Creusot), the Saint-Chamond Co. (the exact name of which would be Compagnie des Forges & Acieries de la Marine & d'Homecourt) and the Chatillon-Commentry-Neuves-Maisons Co.

"Though I am of the opinion that no importance is to be given to the 'pocket-size' knowledge of the man-in-the-street, still I think that such a review as yours can but appreciate some precision on this respect, and sometimes, I imagine that the directors of Messrs. Schneider & Co. must be very surprised to realize what a false, though flattering, idea was spread out in France and elsewhere as to the real importance of their works. But, as the Romans used to say, 'suum cuique'."

Wash Dirt Out of Smoke

"We all know that in heating steel there is apt to be more or less smoke," said Julian Kennedy, engineer, Pittsburgh, at a recent meeting of the Engineers' Society of Western Pennsylvania. "In many cases," Mr. Kennedy continued, "a reducing flame is desirable, which is apt to be smoky, especially if cold steel is charged into the furnace or if the regular operation of the mill is interrupted. It has occurred to me that while much can be done to diminish smoke in the heating furnaces, it might be a good plan, in order to do away entirely with the emission of smoke into the atmosphere, to connect heating furnaces to a common draft flue and conduct the spent gases either through waste heat boilers or direct to a scrubbing chamber and wash them in the same way that A. N. Diehl, of the Carnegie Steel Co., has so successfully cleaned his blast furnace gases. This would be a very simple process and would require much less water than is necessary where gases have to be brought to a low temperature to eliminate moisture so as to fit them for fuel. This treatment would do away with all pollution of the atmosphere, not only by black smoke, but also by the light-colored dust which is very damaging to curtains, furniture, dry goods, etc., though, of course, not quite so bad as the fine carbon in black smoke."

Robert W. Hunt & Co., engineers, Chicago, have tendered the services of their organization to the government at actual cost. The Hunt company feels that its extensive inspection service, with which practically all steel manufacturers are familiar, should be of value to the government in the purchase of the tremendous amount of war material that must be obtained soon. In a letter to the secretary of war, Robert W. Hunt, president of the company, outlines the scope of the Hunt organization and goes into detail regarding the services which it would be in position to perform.

Discuss Electric Furnace Problems

Members of the American Electrochemical Society, at Thirty-first General Meeting at Detroit, Present Practical Papers Dealing With the Problems of Electric Steel Manufacture—Inspect Steel Foundries

PRACTICAL papers dealing with various phases of the design and operation of electric furnaces engaged the attention of members of the American Electrochemical Society, who met at Detroit May 2 to 5 in the thirty-first general meeting of the organization. The electric steel sessions were well attended by executive and operating heads of companies in the electric furnace field.

The first technical session, held Thursday morning, was devoted to electric-steel making, and opened with the paper of J. A. Mathews, president Halcomb Steel Co., Syracuse, N. Y., entitled "Comments on the Electric-Steel Industry". The paper gave a review of the inception of the industry, its early development and present achievements. Mr. Mathews, in his paper, pointed out that electric steel, using molten materials from an open hearth furnace for a charge, can be made of as good quality as that made from cold charges. The electric furnace also saves oxidizable elements, such as chromium, which are lost in remelting in an open hearth furnace.

Electric Steel Melting

The paper by R. F. Flinterman, Michigan Steel Castings Co., Detroit, which followed, was one of the most interesting presented, but unfortunately was not published in advance of the meeting. Mr. Flinterman described the electric furnace in the steel casting plant, indicating in particular the practice at his company where heroult furnaces are employed for producing liquid steel. The paper drew considerable discussion from L. C. Turnbull, consulting engineer, Welland, Ont.; Prof. E. Campbell, Ann Arbor, Mich.; J. L. Dixon, Detroit; Jos. W. Richards and others. Professor Campbell dwelt on the relative solubilities of slag in steel made in acid and basic processes. An interesting feature of Mr. Flinterman's paper was his exhibition of a manganese steel casting, made in the electric furnace, for automobile work.

J. L. Dixon, of the J. A. Crowley Co., Detroit, completed the Thursday morning session with his paper, "Notes on Electric Steel Melting", in which he elaborated on the Grönwall-Dixon furnace made by the Crowley company. Both of the papers presented Thursday morning were unusually interesting because opportunity was provided on Friday for visits to the plants where the furnaces described were in operation, so that the members of the society might study actual operating conditions.

Electric Furnace Operation

The Thursday afternoon technical session was devoted, in the main, to further papers on the electric furnace, particularly from the standpoint of its operation. A paper by C. A. Buck, South Bethlehem, Pa., "The Bethlehem 10-Ton Girod Steel Furnace", gave a description of the furnace now in operation at the Bethlehem Steel company's plant in South Bethlehem, Pa. Details of the buildings, platforms, arrangement of bins, dimensions and equipment of the furnace proper, particularly the electrode regulating device, were presented. The paper discussed the general operation of the furnace using cold charges, the refining by slag, and the composition of certain slags, as well as a variety of steels made in the furnace.

C. H. Vom Bauer read a paper on Rennerfelt furnace operation, in which he dealt with the improvements and changes made in the Rennerfelt furnace. These improvements were made so as to better adopt the original Swedish design of Ivar Rennerfelt to American practice. The furnace is now made circular in shape with one set of electrodes, and oval in shape with two sets; the side electrodes are adjustable in a vertical plane, allowing them to dip toward the bath; and the power for a given size furnace has been largely increased.

"Electrical Characteristics of Electric Furnaces", was the title of the interesting paper by A. A. Meyer, Detroit Edison Co., Detroit. Mr. Meyer carried out an investigation of an heroult and a Grönwall electric steel furnace, covering their construction, operation, load fluctuations, power factors, unbalancing effects on the three-phase system and the determination of the wave distortion by the oscillograph. The study of oscillograph data enables the engineer to draw deductions from them as to the self-induction of the furnace and connections.

The Friday morning session included a number of papers of interest to the iron and steel industry. Dr. O. P. Watts presented a paper by O. L. Kowalke, Madison, Wis., entitled "Acid Resisting Properties of Some Iron-Silicon Alloys", which was discussed by W. R. Mott, Jos. W. Richards and Dr. Watts. The paper described tests made on low carbon iron-silicon alloys containing 1.2 to 19.8 per cent silicon, in 10 per cent solutions of sulphuric hydrochloric and nitric acids, and the losses due to attack were compared. The maximum resistance to attack is at 16 to 18 per cent silicon, and these alloys are very hard and brittle.

E. A. and L. T. Richardson prepared a paper entitled "The Corrosion of Cast Iron and Its Bearing Upon the Electrolytic Theory of Corrosion", which provoked considerable discussion. The authors pointed out that cast iron has not been as extensively studied for its anti-corrosive properties as have steel or pure iron.

Electrolytic Pickling

The meeting was brought to a very successful close with a technical session on Saturday morning, May 5. Among others, the paper "The Electrolytic Pickling of Steel", by M. Dekay Thompson and O. L. Mahlman, Cambridge, Mass., was interesting, as it showed the results that may be secured by electrolytic pickling of steel. The electrolytic method allows for pickling in a short time and the product is said to be very satisfactory. Dr. Carl Hering, Philadelphia, exhibited comparative samples of steels pickled by two methods.

The annual election of officers resulted in the choice of the following: President, C. G. Fink, General Electric Co., New York; vice presidents, H. C. Parmelee, Colorado School of Mines, Golden, Colo.; F. C. Frary, Niagara Falls, N. Y., and J. W. Beckman, San Francisco; managers, L. E. Saunders, Niagara Falls, N. Y.; J. A. Mathews, Syracuse, N. Y.; and A. T. Hinckley, Niagara Falls, N. Y.; treasurer, P. G. Salom, Philadelphia; and secretary, Jos. W. Richards, South Bethlehem, Pa. The presidential address was delivered by the retiring president, F. A. J. Fitzgerald.

Semi-Finished Exports Set Record

March Total of 193,469 Tons Exceeds Any Other Month in History—After February's Slump March Movement in Pig Iron Comes Back to January Total—Scrap Imports Are Most Active

MARCH exports of billets, ingots and blooms established a new monthly high record. They were 193,469 tons, according to figures compiled by the bureau of foreign and domestic commerce, an increase of 62,903 tons over the February figure of 131,566 tons. The preceding highest month was January, with 183,656 tons.

Pig iron shipments to foreign countries again are moving more actively,

VALUE OF VARIOUS EXPORTS.

1915.	Motor trucks.	Agricultural implements.	Metal working machy.
June	$8,578,802	$854,670	$3,735,562
July	6,803,001	963,534	3,872,358
Aug.	4,387,193	1,454,606	3,624,411
Sep.	5,882,255	1,092,797	3,363,973
Oct.	4,307,209	818,606	3,236,079
Nov.	3,837,307	1,054,235	4,644,713
Dec.	3,920,533	1,338,629	3,205,788
1916.			
Jan.	3,416,618	1,139,874	3,249,595
Feb.	6,170,367	1,323,578	4,662,905
Mar.	4,909,179	2,287,605	6,501,022
Apr.	5,259,480	2,066,512	6,552,397
May	4,357,238	2,277,966	9,935,806
June	3,551,148	1,793,355	8,465,985
July	3,062,670	2,016,091	7,814,691
Aug.	4,442,158	2,513,243	8,134,473
Sep.	5,203,215	1,804,475	7,901,328
Oct.	3,635,291	2,023,704	5,292,802
Nov.	5,175,114	1,596,387	4,681,652
Dec.	3,689,314	1,426,956	6,506,205
1917.			
Jan.	3,515,210	2,433,956	8,326,609
Feb.	2,128,665	1,829,525	6,642,827
Mar.	2,961,389	2,113,094	8,281,840

as shown by the export figures for the month of March. The March movement represented a considerable recovery from the reduced rate of February and amounted to 69,629 tons. This compares with 49,018 tons in February and with 69,146 tons in January, 105,195 tons in December, 1916, and 19,439 tons in March, 1916. The pig iron exports for the nine months ending March, 1917, were 645,629 tons, compared with 191,147

IRON ORE IMPORTS, GROSS TONS.

	March, 1917.	March, 1916.	Nine months ending March, 1917.	Nine months ending March, 1916.
Spain	33,785	6,276	171,848	63,610
Sweden	3,960	29,706	127,336	159,307
Canada	4,919	741	87,743	83,863
Cuba	53,325	37,660	519,920	632,399
Oth. countr's	.....	.....	62,625	128,073
Total	95,989	94,383	969,742	1,067,252

tons for the corresponding period of the preceding year. It is apparent therefore, that the March figures have just about maintained the average rate of the past nine months.

Exports of pig iron and semi-finished material for the past 15 months are shown in the following table:

EXPORTS, GROSS TONS.

1916.	Pig iron.	Semi-finished material.
Jan.	18,719	55,315
Feb.	15,061	87,306
Mar.	19,439	107,696
Apr.	18,518	88,764
May	28,293	142,782
June	48,770	116,425
July	28,718	135,827
Aug.	60,264	160,921
Sep.	64,122	163,104
Oct.	101,756	162,679
Nov.	102,786	125,038
Dec.	105,195	162,901
1917.		
Jan.	69,146	183,656
Feb.	49,018	131,566
Mar.	69,629	193,469

Exports of iron and steel and the manufactures thereof for March, 1917, reached the immense total of $111,164,876. The March, 1916 exports of this class of material were valued at only about half this amount, $58,266,144, while February, 1917, showed a total of $85,117,010. The value for the nine-month period ending with March, 1917, is $800,626,622, which is also almost double the figure for the same period in 1916 of $413,377,209.

Imports of iron and steel for the

IMPORTS AND EXPORTS, GROSS TONS.

1915.	Imports.	Exports.
July	20,858	380,340
August	27,556	405,850
September	23,345	382,113
October	34,318	349,843
November	37,131	362,764
December	35,408	353,853
1916.		
January	15,824	354,416
February	20,279	368,869
March	15,159	438,054
April	20,176	384,917
May	32,114	540,580
June	26,786	526,759
July	14,729	503,187
August	32,257	597,739
September	25,559	643,762
October	30,169	610,110
November	42,545	554,856
December	44,134	580,957
1917.		
January	40,192	608,105
February	24,379	449,099
March	37,280	606,559

month of March were valued at $2,107,259, compared with $1,744,075 in February and $1,993,917 for March, 1916. For the nine months ending March, 1917, the import valuation was $21,614,265, compared with $15,512,751 for a similar period ending March, 1916.

Imports of scrap from foreign countries in March worked back to about the level of January. They were 26,809 tons, compared with 15,923 tons in February and 28,066 tons in January. The nine months' total in scrap was 157,163 tons, compared with 79,621 tons in the same period terminating April 1, 1916. Pig iron imports remained practically negligible and continued considerably below the rate

IRON AND STEEL IMPORTS, GROSS TONS.

	March, 1917.	March, 1916.	Nine months ending March, 1917.	Nine months ending March, 1916.
Scrap	26,809	3,635	157,163	79,621
Pig iron	7,405	8,505	98,694	85,544
Steel ingots, blooms & billets	2,459	1,680	15,501	13,697
Wire rods	.....	366	2,063	3,390
Rails	193	412	11,029	39,599
Bar iron	158	162	4,148	5,125
Structural	54	166	730	1,098
Sheets and plates	181	189	1,386	1,310
Tin & terne plate	21	44	574	494
Total	37,280	15,159	291,288	229,878

of the preceding year. The arrivals of pig iron in March amounted to 7,405 tons as against 8,505 tons in March, 1916. The nine months' total is 98,694 tons, against 85,544 tons for the corresponding previous period. The total iron and steel exports for

IRON AND STEEL EXPORTS, GROSS TONS.

	March, 1917.	March, 1916.	Nine months ending March, 1917.	Nine months ending March, 1916.
Scrap	38,506	13,112	203,561	97,978
Pig iron	69,629	19,439	645,629	191,147
Steel billets, Ing. & bl'ms	193,469	107,674	1,414,996	614,235
Wire rods	12,914	11,425	102,629	123,242
Steel rails	52,469	49,034	474,812	420,851
Steel bars	52,366	57,555	561,960	428,675
Iron bars	5,336	10,311	47,377	51,897
Struc. iron and steel	29,509	21,633	258,630	201,937
Hoops, bands and scroll	3,691	4,161	32,336	31,298
Sh'ts & plates	62,711	35,633	442,104	364,911
Tin and terne plate	21,679	20,363	164,268	153,749
Barbed wire	16,079	37,241	263,523	259,853
All oth. wire	16,161	21,139	184,119	178,107
Cut nails	240	317	3,560	3,261
Wire nails	6,823	11,406	97,723	88,421
All oth. nails incl. tacks	1,482	553	13,412	7,188
Pipes & fit'gs	18,121	12,157	190,947	130,761
R. R. spikes	1,822	2,611	14,687	19,290
Bolts, nuts, rivets and washers	2,757	2,432	22,409	23,929
Horseshoes	167	306	3,244	10,010
Cast radiators	628	147	2,768	1,849
Total	606,559	438,649	5,144,694	3,402,589

March were 37,280 tons, compared with 24,379 tons in February and 40,192 tons in January of the present year.

The Pittsburgh Forge & Iron Co. will move its offices from their present location, Penn avenue, to the Chamber of Commerce building, Pittsburgh.

Plans Completed for Wood Ships

Proposed Vessels Will Be Strapped With Steel and Large Tonnage Will Be Required—Boats Will Be Built on Cost Plus Fixed Sum Basis—Steam Power to be Used

PLANS for the new standardized wooden steamships have been completed by the architects of the shipping board, Theodore E. Ferris, 30 Church street, New York. The proposed government vessels will be 281 feet 6 inches in length overall. The length between perpendiculars will be 268 feet. Over the planking, the beam of the new vessels will be 46 feet and their depth will be 26 feet. The vessels will be of the single deck type with open holds and shifting and 'tween decks. The new wooden steamers will have a displacement of 3,500 tons on a draft of 23½ feet. The cargo carrying capacity will be approximately 3,000 tons.

To stiffen the hull, wing-girder keelsons will be installed in addition to the main center keelson. The hull also will be stanchioned with two rows of pillars. Further stiffness will be obtained by a system of diagonal steel strapping. The straps will be ½ x 4 inches in cross sections and will go around the turn of the bilge. They will connect with a ¾ x 8-inch steel chord at the top. No knees will be used in the construction of these hulls. Instead the decks will be secured by clamps and shelf timbers. Two separate designs for the frames have been provided, one for yellow pine and the other for western fir. The timber in the fir boats, of course, will be considerably larger than in those built of pine. The construction of each hull will require about 1,500,000 feet of lumber, board measure.

Each vessel will have four hatches, two masts and eight cargo booms. The machinery and crew's quarters will be amidships. A forecastle head and poop deck also will be provided.

Steam Will be Used

Some of the boats may be powered by internal combustion oil engines, although the great majority of the crafts will be fitted with steam power. The government is making arrangements to obtain triple expansion engines of the ordinary type or reduction gear turbines for this purpose. The engines or turbines will deliver approximately 1,400 horsepower to a single screw. The screw will be 15 feet in diameter. It is expected that the boats will have an ordinary speed of 10 knots. In order to escape attack this speed may be increased to 11¼ knots by opening the by-passes between the high and low pressure cylinders. Steam will be generated in water tube boilers operating under forced draft. Either coal or oil fuel will be utilized as circumstances may dictate. About 500 tons of bunker capacity is provided including 350 tons of reserve bunker capacity. Each vessel will have accommodations for a crew of 30 men. Additional accommodations for 12 gunners will be provided and the guns will be mounted fore and aft. The vessels will be electric lighted and fully equipped with wireless and other protective devices.

Up to the time this article was prepared contracts for the construction of these vessels had been let by the United States Shipping Board Emergency Fleet Corporation to the Foundation Co., New York, Sanderson & Porter, New York, and T. C. Desmond & Co., New York. The Foundation Co. and Sanderson & Porter both have had extensive experience in the general construction field. The two Sanderson & Porter yards will be located on Gray's Harbor and Willapa Harbor, Washington, respectively. These two harbors are adjacent to the greatest lumber producing region in the world. It is stated that the Sanderson & Porter yards will each have sufficient capacity for the construction of 20 vessels at one time. It has been announced that the Foundation Co. expects to locate one of its wooden ship building plants near New York City. Another may be operated near San Francisco. This company expects to employ 3,000 men in the construction of wooden vessels.

Thirty vessels are said to be covered by the contracts awarded to T. C. Desmond & Co. These vessels it is stated, will be constructed at yards owned by the company at Essex, Mass. and Thomastown, Me. It is possible that another yard will be built near New York City.

According to the terms of the contract under which the government proposes to have its wooden ships built, the ship builder will be reimbursed for the actual cost of the work, plus a fee or profit of $20,000 per hull. This covers the construction of the hulls only. The machinery will be installed under separate arrangements. The contract goes into detail as to cost items and in addition to direct labor and material costs, the ship builder is authorized to charge a proper proportion of his overhead expenses to the government.

The contract provides for monthly payments to the ship builder within 15 days after the submission of bills to cover the accrued actual cost for the previous month. A bonus of $200 per day will be paid for every day gained over the time specified in the contract; conversely, a penalty of $200 per day will be exacted for each day's delay beyond the specified contract time.

Central Fitting Out Stations

Under the existing plans, the ship builder will construct the hulls complete but will not install the engines or boilers. These will be furnished direct by the government and will be installed at central fitting out stations which will be provided at convenient points along both coasts. The ship builder will be required to furnish all the lumber, fastenings, paint, rigging, fittings, electrical equipment, etc., for the hull. The contract, however, provides that the government will have full control of all orders for material, machinery, equipment, supplies, etc., this provision being inserted to insure the delivery of materials of satisfactory quality. It is expected that the hulls constructed under this arrangement will cost about $70 per ton, or $210,000. The machinery, it is believed, will cost $100 per horsepower or $140,000 in addition. The total cost of each vessel will probably range from $360,000 to $400,000.

To build a vessel of this character, ship builders estimate that the labor of 120 men will be required for four months. On the New England coast where smaller crews are worked, it is believed that seven months may be necessary for the construction of a hull, employing 60 men. The efforts of over 40,000 men, therefore, would be required to turn out the hulls alone at the rate of 1,000 a year. Probably an equal number would be engaged in making and installing the machinery.

Prepare For War On Huge Scale

Devote Nation's Power to Munitions, Ships, Foodstuffs and Money—Government to Act as Fiscal Agent For Allies—Reserve of Industrial Workers Forming —American Railroad Equipment Needed Abroad

WASHINGTON, May 8.—Developments last week gave further emphasis to the vast military program under way and to the extremely important part the United States is to take in the war. Many of the details were brought out at conferences of governors of the states, in plans outlined at discussions between members of the French and British commissions and government officials, and through interviews with individual members of the foreign commissions, a swell as by activities of government departments. The proposals crystallize themselves into a thorough system of co-operation and centralization. They deal with gigantic undertakings by which the United States is to give powerful aid by way of supplying munitions, ships, food supplies and money to the entente allies and to make tremendous purchases of these essentials for itself, and to build up a national service reserve.

One of the outstanding features is the fact that the United States government from now on will take into its own hands the fiscal agency for the allies in this country through handling the $3,000,000,000 loan which is to be furnished them. This means the displacing in that capacity of the firm of J. P. Morgan & Co., which has been acting as the fiscal agent in the United States for the allies. Moreover, it was intimated by Sir Hardman Lever, of the British commission, that after the expenditure of the $225,000,000, which has been loaned to Great Britain by this government, will also take over from the Morgan firm the work of purchasing supplies for the allies. It is taken from this that there is a well defined program being prepared by which munitions and other supplies both for the United States and the allies will be bought at uniform prices. It has been observed regarding this plan that members of the British and French commissions have sounded warnings against procuring these supplies at prices that would mean dangerously narrow profits for manufacturers of the United States. Members of those commissions have called this to the attention of officials of this government in the course of discussions as to the necessity of building up a carefully organized industrial reserve. Through this reserve, not only would the government have charge of workers in private plants throughout the country engaged in work associated with the national defense, but it would also avoid the mistake of sending skilled laborers to the battle lines. The plan for the industrial reserve has already been approved by the war department and was submitted to the council of national defense at the governors' conference. It is understood that a bill to build up this reserve has been drafted.

The plans for the reserve were presented at the conference by George Wharton Pepper, a representative of the Pennsylvania state defense council. The reserve would be headed by a board of nine men, operating through a national committee of members from all the states. The headquarters committee to direct the activities of the state and district committees would be located at Washington. Former President Taft, Maj. Gen. Goethals and Henry L. Stimson, formerly secretary of war, have tentatively accepted membership on the board, according to reports. It would be the duty of the organization to furnish any military or civic service which could not be performed by enlisted men, to aid in recruiting, to work under any private employer engaged on government contracts, or on farms, and to supply the army and navy. The plan for this government to act as the agent for purchasing supplies for the allies is said to call for the selection of a committee, probably headed by a cabinet officer, with the prospect that a ministry of munitions would be created.

France Needs Railroads

Another of the great tasks that this country has been called upon to perform is made known with the announcement that France has asked for 10,000 railroad workers to take charge of French trains and for 1,500 miles of railroad track, including rails and fastenings. In addition, it is planned to provide locomotives and cars for that country, and perhaps others of the allies. It has been asserted that the United States can supply the men and materials and will do so if the plan is approved by the President. To carry out this plan would mean severe curtailment of American railroad schedules. It was announced by Daniel O. Willard, of the advisory commission of the council of national defense, that plans are now under way to limit passenger train service and economize in every way on local transportation in order to send abroad the men and rolling stock for the allies. In his speech, made before the governors' conference, Mr. Willard said that as far as possible, passenger locomotives will be transferred to freight traffic and he expressed the hope that 4,000 of the 14,000 passenger locomotives in this country could be so used. He also said that by reducing the time allowed shippers to load and unload, the railroads of this country can save 245,000 freight cars for one trip a year. The limit, he said, can be reduced from 48 to 24 hours. He asserted that there will be more war time rail business than the lines can handle. One of the questions which perhaps will be solved in the immediate future is the transportation of tremendous tonnages of coal for export to France. The government has also planned to send to Russia soon a commission of four railroad experts to help reorganize the Russian transportation systems. The members are: John F. Stevens, New York, former chief engineer of the Panama canal commission; John C. Greiner, Baltimore, consulting engineer; Henry Miller, former president of the Wabash and an official of the Burlington road yet to be named.

Interesting remarks were made at the governors' conference by Howard E. Coffin, member of the advisory commission of the council of national defense and chairman of the committee to bring about standardization in war equipment, especially in aeroplanes. Mr. Coffin told the delegates that America must use the munitions standards of the allies to promote efficiency, and that American troops that go to France must use the munitions of the allies, who are manufacturing them faster than they can turn them against the Germans. "If our army is to be of service there," said Mr. Coffin, "it must use European standards. To carry our standards abroad would create endless confusion. We would have to establish factories abroad. Allied contracts are lapsing here now, and we can use the output of our own factories equipped to manufacture according to European specifications. We face entry into the war with the great advantage of having numerous factories working on war contracts and with thousands of skilled men available. This is a

tremendous start. Had we entered the war two years ago, we would have had to do what England has done—take over our factories.

"The government will be able to produce its supplies with as little diversion of other factories to munitions manufacture as possible. Even those to be changed over will not lose their normal percentage, as we hope to change them by percentage and let them continue to carry on their usual business as well as their war business. Otherwise we would cripple industry. Factories can supply the government with 25 to 50 per cent of their output and continue their organization."

Mr. Coffin said this country will need more airplanes than it can possibly produce. The British, he said, sometimes had as many as 1,000 machines in the air on a single front and kept behind the lines from 15,000 to 20,000 more machines than the Germans possess. Rifles are produced now at the rate of 17,000 to 20,000 a day, Mr. Coffin said, and more ammunition is being manufactured than the whole world can use. Machine guns, he said, could be supplied as fast as needed. He asserted that most of the big guns the country makes will continue to go to the allies, although American military forces are in need of them. It will become necessary, he said, to greatly increase big gun manufacturing facilities in the United States.

Government to Divert Steel to New Ships

WASHINGTON, May 8.—How to obtain the necessary steel, under present conditions, is the big problem in the plans now being formulated by the United States shipping board to construct a large fleet of steel merchant vessels as well as 1,000 wooden craft. One plan is to have the steel manufacturers forego contracts for material with private consumers especially those engaged in commercial building lines. Legislation is under way to clothe the government not only to commandeer ship yards and to take over vessels building in this country for foreign account but also to compel steel plants to divert their capacity from private undertakings to the filling of the government needs of ship material. There is however considerable irresponsible talk being indulged in with regard to the government commandeering private plants of various kinds. Under the present methods of hearty cooperation, such drastic action is unnecessary.

The proposed steel vessels will be small, of from 3,000 to 4,000 tons each, and, like the wooden ships, are to be built under standardization methods now being worked out by Maj. Gen. George Goethals. It is said the number of steel ships has not been determined The board, it is believed, will build as many steel ships as the capacity of the steel mills and the ship yards will permit. That an earnest effort will be made to comply with the wishes of Great Britain for 100 steel ships seems probable. The seriousness of the submarine menace is being fully recognized by government officials. It is desired that the American people be made thoroughly aware of the gravity of the war situation without inciting undue alarm.

The plan of building standardized steel merchant ships in reality is based upon suggestions broached about two year ago before the house committee on merchant marine and fisheries by F. W. Stratton of the American bureau of shipping, during hearings on the administration shipping bill. The idea of Mr. Stratton was seized upon by Secretary of Commerce William C. Redfield, who had prepared drawings of ships which could be constructed from standard steel parts to be turned out in large quantities. It is believed however that some of the optimism as to the ability of the steel plants, under present conditions to meet the demands for material, is unwarranted. The board believes the ships can be put together at any point affording water for launching and room for ways. The work is held to be purely one of assembling fabricated parts, produced in various districts and shipped to the yards.

In the past, it has been pointed out, all steel ship building in the United States has been done along individual lines necessitating special designs, different specifications of material, particular manufacturing equipment, etc. Each ship, in consequence, carried its own problems. Under the new plans every part to the last bolt and rivet will be of standard size and design. It is believed the ship can be put together without the aid of skilled men, highly skilled engineers, draftsmen or structural forces.

It was the original idea of Secretary Redfield that the designs call for cargo carrying oil burners, of large capacity, and with auxiliary sails. It is not known, however, whether the shipping board will adhere to the motor and sail provisions. The question of obtaining engines is recognized as being a serious problem. The activities of the board with regard to plans for steel ships are said to have been stimulated following a conference of Admiral De Chair of the British commission, Secretary Redfield and Gen. Goethals.

Reports that the shipping board is about to abandon its plant for building 1,000 wooden ships are denied by Theodore Brent in a statement to *The Iron Trade Review*. It is declared the adoption of the steel ship program will not interfere with the construction of wooden ships. It is known, however, that the steel vessel is desired more than the wooden ship because of its permanent value in building up a merchant marine for use after the war. There is apparently a belief on the part of some government officials that the yards building steel ships are not realizing their full potential capacity. This impression is said to be based on an investigation looking to the possibilities of expanding these yards.

Tariff Board Prepares to Get to Work

Washington, May 8.—Plans under consideration for the new tariff board to take up actual work of gathering data this summer, both in this country and abroad have aroused considerable interest. By some it is thought that the administration has taken up this program as a preliminary to revision of the tariff at the regular session of congress beginning next December. It is reported that some members of the commission may visit Great Britain, France, China and Japan to study trade problems which will confront the United States after the war. Commissioners Culbertson and Costigan, it is understood, will conduct the foreign investigation, while Chairman Taussig and the other members take up an investigation in the United States. Careful inquiry is to be made into details of the Paris economy pact agreed upon last June by the entente allies with a view to determining what effect it will have on trade conditions in this country. The data to be gathered, it is expected, will be ready for submission to the President and congress before the latter body convenes in regular session next December.

The engineering, sales and purchasing departments of the William Tod Co., Youngstown, O., now controlled by the United Engineering & Foundry Co., Pittsburgh, have been moved to the latter city. G. Walter Sanborn is purchasing agent of the Tod company.

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

CHARLES H. BOOTH has resigned both as chairman and member of the executive committee of the United Engineering & Foundry Co., Pittsburgh, because of ill health. He will continue as a director. Mr. Booth has occupied a high position as a manufacturer of heavy foundry and machine shop products, especially of rolling mill equipment and accessories. His father, the late Lloyd Booth, founded the Booth & Miller foundry and machine shops at Youngstown, which later became Lloyd Booth & Co. and now constitute the Lloyd Booth works of the United Engineering & Foundry Co. This plant was among the first in this country to design and build tin plate mills. Mr. Booth has actively participated in the affairs of the National Founders' Association and of the National Metal Trades Association. He has served as a member of the administrative council of the National Founders' Association.

George H. Rolinson has been appointed superintendent of the foundry operated by the Connersville Blower Co., Connersville, Ind.

Julian Kennedy, Pittsburgh engineer, has been appointed a member of the state committee on public safety by M. G. Brumbaugh, governor of Pennsylvania.

Joel W. Burdick, president of the West Penn Steel Co., Brackenridge, Pa., has been made a director of the Bank of Pittsburgh, succeeding the late Reuben Miller.

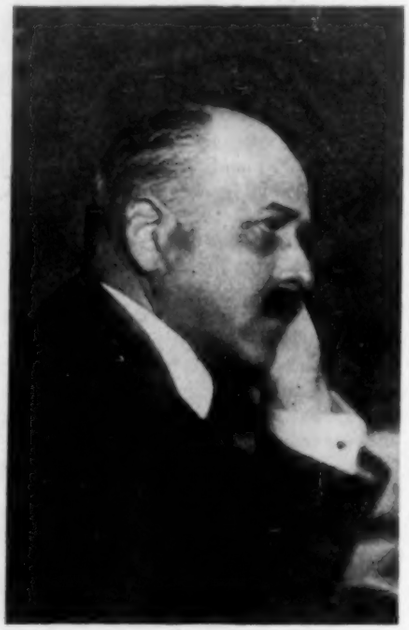
M. G. Butler, former division rate clerk in the Youngstown offices of the Erie railroad, became traffic manager of the new Mahoning Valley Steel Co., May 1.

W. Shives Fisher, of the hardware firm Emerson & Fisher, St. John, N. B., has been appointed by the Canadian government as commissioner in charge of the Dominion Rifle Factory, Quebec.

A. F. Ehrbar has been appointed to the position of general manager of the Duplex Mfg. & Foundry Co., Elyria, O., and has assumed the duties of the retiring president.

F. S. Reitzel, formerly comptroller of the Pennsylvania Steel Co. and more recently of the American Iron & Steel Mfg. Co. and associated with B. Dawson Coleman in the sale of the latter company to the Bethlehem Steel Corporation, has been appointed comptroller of Manning, Maxwell & Moore, Inc., New York.

Clinton E. Woods, for the past two years advisory engineer at the plant of the Remington Arms-Union Metallic Co., Bridgeport, Conn., resigned May 1, to enter business as an industrial engineer with offices in Bridgeport and New York City. The entire executive staff of the company tendered him a farewell banquet April 28.



CHARLES H. BOOTH

E. S. Fenning, Hartford, Conn., has succeeded Thomas L. Fay as superintendent of the Norfolk Mfg. Co., Norfolk, Conn. Mr. Fay will continue in the employ of the company.

Walter P. Dodge, for many years manager for Barney & Berry, skate makers, Springfield, Mass., has resigned to become sales manager of the reorganized Krebs Motor Truck Co., Clyde, O.

Clarence E. Bilton, president of the Bilton Machine Tool Co., Bridgeport, Conn., has been elected president of the Manufacturers' Association of that city to succeed James G. Ludlam, resigned.

H, B. Coleman, formerly sales manager of the Russell & Erwin Mfg. Co., New Britain, Conn., has purchased an interest in the Schoedinger-Marr Co., Columbus, O., and will be its general manager.

Arthur W. Lyle has been appointed superintendent of the blooming mill and rod mill of the Keystone Steel & Wire Co., Peoria, Ill. He was formerly connected with the Jones & Laughlin Steel Co., Woodlawn, Pa.

F. C. Smink, president of the Reading Iron Co., has been elected president of the new Blandon Rolling Mills Co. recently organized to operate the old mill at Blandon, Pa. Wm. Seyfert is president, Samuel R. Seyfert, treasurer and manager and Samuel Pflum, secretary.

H. A. Whitaker, of the Cambria Steel Co. plant of the Midvale Steel & Ordnance Co., on May 1 began his new duties as general superintendent of the Worth Bros. Co. plant, Coatesville, Pa., of that corporation. Mr. Whitaker succeeds Harry I. Schotter, resigned.

Herbert J. Douglas, for 14 years comptroller of the Sherwin-Williams Co., Cleveland, has resigned from that position to become comptroller of the Standard Parts Co., Cleveland. For the past three years Mr. Douglass has been a member of the company's board of managers.

Barton L. Little, who for a number of years has been in charge of the western interests of the United Alloy Steel Corporation, Canton, O., has tendered his resignation, effective June 1, to join the Interstate Iron & Steel Co., Chicago, as general manager of sales.

John G. Utz, chief engineer of the Standard Parts Co., Cleveland, and chairman of the Standards committee of the Society of Automobile Engineers, presided at a meeting of the committee at Cleveland, May 2. Standardization of gas engine parts was considered.

H. E. Whitefield, professor of engineering, the University of Western Australia, spoke recently before the Pittsburgh section of the American Chemical Society. He referred to the numerous blunders made by Great Britain in manufacturing munitions during the early stages of the war.

Dwight C. Daniels, mechanical engineer of the Sanford Riley Stoker Co., Worcester, Mass., has entered the United States naval torpedo sta-

tion, Newport, R. I., as a first lieutenant in the reserve officers corps. He is the son of Fred H. Daniels, who at the time of his death was chief engineer of the American Steel & Wire Co.

Thomas Findley, formerly vice president of the Massey-Harris Co., agricultural implement manufacturer, Toronto, has been elected president of the company, succeeding the late Sir Lyman Melvin Jones. J. W. Shenstone, former treasurer, has been appointed to fill the office vacated by Mr. Findley. C. L. Wisner, formerly secretary, assumes the office of second vice president.

H. H. Pleasance has been appointed manager of sales of the United Alloy Steel Corporation, Canton. E. D. Rogers, who has been vice president and manager of sales, will continue as vice president of the company. Mr. Pleasance has been assistant manager of sales for the United Alloy Steel Corporation for a number of years.

John D. Hurley, vice president of the Independent Pneumatic Tool Co., Chicago, has been elected president to succeed the late James Buchanan Brady. Ralph S. Cooper, manager of the New York office of the company, has been made vice president to succeed Mr. Hurley and Robt. T. Scott, manager of the Pittsburgh branch has been elected a director and member of the executive board.

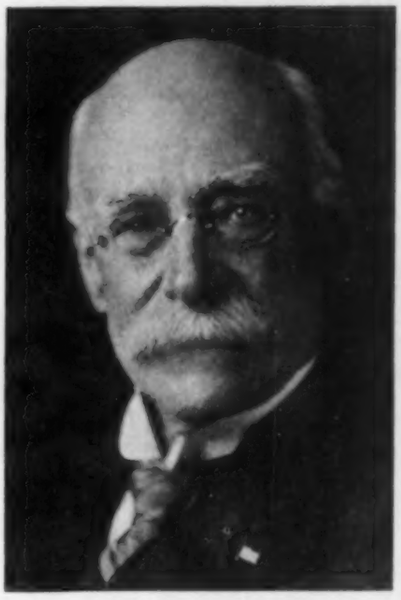
A. T. Van Scoy, Milwaukee, secretary and general manager of the Milwaukee works of the International Harvester Corporation, has been appointed a member of the Wisconsin state council for defense, just created by the state legislature, as representative of the manufacturing interests of Wisconsin. Percy C. Eldredge, assistant general superintendent of the Chicago, Milwaukee & St. Paul Railway Co., will represent the transportation interests on the board.

A. N. Diehl has been appointed assistant to William Whigham, vice president of the Carnegie Steel Co., with offices at Pittsburgh. S. G. Worton, formerly superintendent of the open hearth department at the Duquesne works of the company, has succeeded Mr. Diehl as assistant general superintendent of the Duquesne plant. R. B. Bostwick has succeeded Mr. Worton. F. W. Underwood has been appointed superintendent of river transportation of the Carnegie company.

De Courcey Cleveland, recently elected president of the Central Foundry Co., has been associated with this company since 1909 in various official capacities. After two years' experience with Milliken Bros., Mr. Cleveland became treasurer of the Central Foundry Co., later vice president and now president succeeding Waddill Catchings, who recently resigned. R. R. Rust, succeeds Mr. Cleveland as vice president, and F. D. Griffith, who had been in the sales department, succeeds Mr. Rust as secretary. Mr. Cleveland was a certified accountant for several years previous to his becoming interested in iron and steel affairs.

G. W. Cope, Dean of Trade Journalism, Retires

George W. Cope, pioneer in trade journalism and for more than a generation in constant contact with the iron and steel trade in various capacities, has rounded out a distinguished career of service and capability. On May 1, he retired from active participation with the editorial direction of *The Iron Age*. Mr. Cope entered the service of the American Iron and Steel Association at Philadelphia in 1873, where he became associated with James M. Swank. At this time the pig iron output of the country was about 2,500,000 tons, and in the 44 years of his connection with the iron trade Mr. Cope has watched the annual output grow to nearly 40,000,000 tons. During the first years of his connection with the American Iron and Steel Association, Mr. Cope's duties were to meet iron and steel producers, win their confidence and secure their co-operation in the association's plans for building up the industry. He laid the foundations for the statistical work which made that institution famous.



GEORGE W. COPE

In 1883, Mr. Cope became associate editor of *The Iron Age* in New York. Two years later he resigned to become secretary of the American Iron and Steel Association, Mr. Swank having been elected general manager. In 1887, Mr. Cope again joined the staff of *The Iron Age*, this time as western editor with headquarters at Chicago. His service at this post lengthened into 15 years, after which, in 1902, he returned to the home office in New York. He has spent most of the past 15 years as managing editor, in addition to pursuing editorial writing conducting the copy desk, and carrying on other supervisory duties.

The outstanding characteristics of Mr. Cope's editorial career have been his untiring industry, his uniform courtesy which gained and held for him a legion of friends, and his keen sense of responsibility in handling the important questions involved in iron and steel market reporting. A number of Mr. Cope's business associates recently tendered him a dinner at the Engineers' Club, New York, "to signalize more than a generation of distinguished service in iron trade journalism—years of never flagging industry and of unswerving devotion to high ideals."

Franklin Institute Will Award Medals

The Franklin Institute, Philadelphia, will present the Franklin medal to his excellency Chevalier Van Rappard, of the Netherlands government for Hendrik Antoon Lorentz, Ph. D., F. R. S., president of the Royal Academy of Sciences, Amsterdam, at a meeting May 16. David Watson Taylor, D. Eng., chief constructor, chief of bureau of construction and repair, United States Navy, will also receive the Franklin medal. Following the presentation of medals, Mr. Taylor will give an address on "The Science of Naval Architecture".

Forms Export Company

The Pittsburgh Export Co. has been organized by J. Rogers Flannery, of the Flannery interests; Frank J. Lanahan, the Fort Pitt Malleable Iron Co.; Charles J. Graham, the Graham Nut Co., and J. J. Nordman, former secretary of the Foreign Trade Commission, Pittsburgh. They are president, vice president, treasurer and secretary, respectively, of the new company. Offices have been opened in the Farmers Bank building. The company represents W. Dederich, Ltd., London, and Masters & Co., Ltd., Montreal, Canada.

The Pyrites Co., Ltd., Wilmington, Del., which recently completed one unit of its new plant, has decided to build one or probably two additional units.

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

War Loan Overshadows All Financing

WALL street's one big thought has been of the $2,000,000,000 "liberty" loan, subscriptions to which will be taken until June 27. The bonds will be dated July 1, 1917, and will bear interest at the rate of 3½ per cent. If later the government floats another issue at a higher rate, the rate on the present loan will be advanced.

Such a sum as this was never before raised in this country in a single operation. The "billion-dollar steel flotation" of 1901 consisted largely of the conversion of securities of half a dozen companies into the shares of one. The United States government, even in war times has never attempted to raise more than two or three hundred million within a 60-day period.

So Wall street is asking itself what will be the effect of this tremendous issue upon the investment market. Banking and brokerage circles are confident the loan will be more than successful. Present indications are that it will be heavily oversubscribed. But there is some doubt as to the effects of the operation upon the general investment market, some people maintaining that the diversion of funds from ordinary channels will bring about lower prices for railroad and industrial securities. Others, however, advance apparently logical arguments for further strength in the general market. They point out that over $1,000,000,000 was loaned the allies last year by a comparatively narrow circle of investors; the people at large did not participate in these advances. At least one-half of the "liberty" loan will be turned over to the allies, whereas they would have borrowed this amount from the American market anyhow, so that no more capital will be absorbed in this way than if the country had remained neutral. Further, the proceeds of the loan will be spent in the United States, and profits from immense production will continue. Secretary McAdoo says the payments on the loan will be arranged in such a way as not to cause inconvenience or create disturbance, and that the money will only be taken as occasion requires, so that a minimum amount will be drawn from the channels of business.

New financing by railroads and industrial corporations has decreased sharply since this country entered the war, amounting only to $130,141,500 last month, as compared with $221,598,000 a year ago. The sharpest cut was in industrial flotations, but railroad offerings are also being radically curtailed. Because of the condition of the security market and the need of the government for money, the New York Central has decided not to issue $10,000,000 bonds, for which it recently received permission in New York. This road's recent plans to sell $25,000,000 stock to shareholders also have been cancelled by the declining market in railroad stocks. The Delaware & Lackawanna will not issue $4,000,000 bonds, the proceeds of which it had planned to spend in improvements at Albany.

In the face of the greatest gross earnings in railroad history, rail stocks are selling at lower prices than the minimum quotations established in the panic years of 1907 and 1893. Railroad bonds also have been steadily declining since Jan. 1, net losses at this time ranging from four to nine points. While the preparation for the war loan is probably a factor in this softening, the most important influence is the unfavorable showing of net profits as compared with gross, due to increased costs.

Automobile stocks also have been heavy due to concern over the proposed tax of 5 per cent on all gross sales by manufacturers. As this tax would be collected before application of the ordinary excess profit tax, it probably would be passed on to purchasers. Evidently the purpose of the government is not so much to raise revenues from automobiles as to force a diversion of labor and material to other lines of industry. The steel stocks and other classes of securities also eased off the past week However, taken as a whole, the action of the stock market, reflecting the attitude of general business was extremely satisfactory in the face of the enormous national financing.

Corporation Adds Huge Sum to Assets

Since its organization in 1901, the United States Steel Corporation up to Dec. 31, 1916, spent $996,011,000 for depreciation, sinking funds and ordinary repairs, or a total of $128,000,000 over the combined par value of the preferred and common stocks outstanding. An addition of $344,892,317 was made to assets. Earning power since organization has been increased 108½ per cent, it is estimated, by the enlargement of mills. It is computed that by the close of the present year nearly $650,000,000 will have been spent for new construction and acquisitions. By the close of 1916, 332,865,573 tons of iron ore and 121,867,633 tons of coal have been extracted from the Corporation's mines. Between organization and Jan. 1, 1917, the wages and salary disbursements aggregated $2,475,387,267.

Midvale Quarterly Earnings Gain Heavily

Net profits were earned during the first quarter of 1917 by the Midvale Steel Co. at the rate of $53,600,000 per year after paying all charges. The profits for this quarter are $15,859,000, a gain of $2,451,000 over the last quarter of 1916. The earnings represent $26.80 per share on the $100,000,000 capital stock. After deduction of depreciation, interest and taxes the final balance of the shares in the first quarter of this year is $6.01. In 1916 Midvale naturally made no special allowance for excess profits tax. This tax has been deducted in the March quarter.

Would Tax Excess Profits

Toronto, Can., May 8.—Sir Thomas White, Canadian finance minister, recently announced in the house of commons that a bill would be introduced increasing the business tax excess

profits. Where annual profits exceed 15 per cent, the tax will be 50 per cent on such excess; and where the profits exceed 20 per cent per annum, the tax will be 75 per cent on all profits in excess of 20 per cent. The tax is to take effect from May 18, 1916. Profits of less than 15 per cent are not affected by this enactment, the tax remaining at 25 per cent on the excess over 7 per cent. No difference is made between companies engaged in the manufacture of war munitions and supplies and other industries. The proposed measure has been subjected to much criticism in financial circles as being too drastic, and likely to affect adversely the stability of Canadian industries.

Steel Foundries Show Large Surplus

The American Steel Foundries net earnings for the first quarter of 1917 are $3,104,814. The surplus, after deducting all charges, is $2,401,402. The equivalent earnings per share amount to $13.97, compared with $2.88 a share during 1916. The table shows earnings for corresponding periods of previous year:

	1917.	1916.	1915.
Net earn.....	$3,104,814	$783,707	†$89,736
Other inc.....	75,164	23,835	13,278
Total inc.....	$3,179,978	$807,542	†$76,485
Charges, etc....	778,576	311,932	179,848
Surplus	$2,401,402	$495,610	†$265,333

†Deficit.

Financial Crop Ends

The Superior Steel Co., Carnegie, Pa., during the nine months of the present fiscal year earned $34.95 on its $6,000,000 common stock.

* * *

The Carlson-Wenstrom Mfg. Co., a subsidiary of Carwen Steel Tool Co., has declared a dividend of 25 per cent, payable forthwith.

* * *

Directors of the Colorado Fuel & Iron Co., Denver, have declared a 2 per cent quarterly dividend on preferred stock, payable May 20 to holders of record May 7.

* * *

An extra dividend of 2 per cent, as well as the regular quarterly dividend of 2 per cent, has been declared by the Solvay Process Co., Solvay, N. Y., payable to holders of common stock.

* * *

The Penn Metal Co., Boston, has elected the following officers for the ensuing year: George A. Sagendorph, president; Francis M. Johnson, vice president; George Taylor, treasurer, and James P. Dolan, secretary.

* * *

Transfer from surplus account to the capital account occasioned the recent increase from $125,000 to $500,000 in the capital of the Van Brunt Mfg. Co., Horicon, Wis., makers of seeding machines, it is officially advised.

* * *

A cash balance of $1,015,221 and of unfilled orders insuring its estimated profits of about $2,000,000, it is reported by Gaston, Williams & Wigmore, Inc., of New York City, at the close of April.

Sulphate Buying

Being Pushed by Campaign for Increased Foodstuffs

New York, May 5.—Contract buying of sulphate of ammonia for the coming year, from present indications, is about to be begun. A number of large tonnages are under negotiation. The coming year's requirements are expected to show a material increase due to the country-wide efforts to stimulate food production. Demand for sulphate for spot shipment is quiet. Current price range from $4.70 to $4.80 per 100 pounds, at seaboard. The contract market has not yet been established.

The situation in toluol continues rather indefinite since makers are not certain what further demand will originate in government requirements of trinitrotoluol. As a result, they are refusing to enter any further contracts at this time. Sales during the week have been restricted to small lots for spot shipment. The market on toluol continues to be quoted at $1.75 to $2 per gallon, at producers' plant, for spot and at $1.50 to $1.75 for contract. Demand for benzol continues fairly active both for spot and contract. Makers are not anxious to contract since it is considered likely that the government requirements will call for benzol as well as toluol. Pure benzol remains at 55 to 60 cents per gallon, at producers' plant, both for spot and contract. Business in phenol during the week has been restricted to spot buying. Supplies are small and this market is strong. Phenol continues to be quoted at 42c to 45c per pound, at producers' plant, for spot, and at 45c for contract. The situation in solvent naphtha is unchanged. This product reflects little strength, but the volume of business has further increased, especially in contract buying. Prices are at 18c to 25 cents a gallon, at producers' plant, for spot, and at 18c to 22c for contract.

The Eastern Malleable Iron Co. has announced wage increases of from 10 to 20 per cent in bonuses allowed employes in its plants at Bridgeport, Conn., Troy, N. Y., Wilmington, Del., New Britain, Conn., and Nauguatuck, R. I.

Treason Charge

Invoked by Government to Prevent War Labor Disturbances

Positive and effective measures are being adopted by the government to prevent any labor disturbances in plants which are manufacturing war supplies. A threat to prefer charges of treason against the prospective strike leader, averted a walkout of 96 machinists engaged in the manufacture of torpedoes at the plant of the E. W. Bliss Co., Brooklyn, May 2 The workers demanded Saturday afternoons off with pay, but were refused. The machinists then voted to strike. The situation was brought to the attention of the military authorities on Governor's Island and the latter immediately informed the leader that if he called a strike he would lay himself open to a charge of treason. The strike order immediately was withdrawn. The E. W. Bliss Co. since has drawn up an agreement subject to approval by the government that the men shall work nine hours on week days and be granted a half holiday on Saturdays.

About 500 boiler makers and helpers at the plant of the Chicago Ship Building Co. have been on a strike which has occasioned government inquiry. Representatives of the department of justice called in a committee of the boiler makers and instructed them as to the situation with regard to war conditions and to the danger of attempting to interfere with the progress of work of importance. No demands were made on the company by the strikers, and officials of the union assert they did not call the strike, nor did they know who had. The workers have returned in small groups and the trouble is apparently over. The possibility of foreign interference with American ship building, as a possible cause of the walk-out, is being probed at the present time by officials of the company.

Ascertain Possible Use of Woman Labor

The Pennsylvania railroad, to aid in conserving labor during the present national crisis, has decided to offer opportunities of employment wherever possible to girls and women. Every general superintendent on the Pennsylvania lines east of Pittsburgh has been directed to investigate and report in what capacities girls or women can be employed efficiently in all departments of the railroad, what numbers can be utilized and to what extent they can perform the work now being done by men.

Needs Machine Tool Buying Board

Organized Purchasing Department Under Direction of Competent Tool Expert Will Save Lost Motion Say Dealers—Federal Purchases Heavy But Greater Buying to Come—Cranes at a Premium—Prices Again Advance

EVER SINCE this country entered the war, attention of machinery builders has been centered upon the equipment needs of the government. The actual placing of orders thus far is considered barely a taste of what is in store. It is believed the government buying will be actually stupendous, but much delay is necessarily being encountered while an efficient organization is being effected at Washington for the purchase of different supplies. At present there is a great deal of lost motion, due to the absence of system. Machinery builders are anxious to do all they can toward national defense, but lack of capable direction is handicapping their efforts. A growing feeling is evident in the machinery trade that a government machine tool department should be established, with a practical man at its head, who should have qualified assistants to supervise purchases of the various types of tools needed. An example of present misdirected energy is seen in the fact that plant capacity which might be devoted to producing equipment for use in connection with submarine chasers and cargo boats, for which there is most pressing need, even now is building equipment for the government which will not be needed to turn out material for three or four years. In the last few days some of the leading builders have instructed their sales forces that estimates on commercial work must be made subject to revision, and that contracts be accepted only with this understanding on the part of buyers, due to uncertainty as to how government work will affect order books. Thus, instead of promising to make deliveries, say 12 months ahead, they can only promise to try to make deliveries then.

While many contracts for munitions have been let by the bureau of ordnance of the navy and war departments, in the past week, many plants receiving shell orders are already equipped and little important equipment business has resulted. A number of plants, however, which have not been engaged in making war material, are asking prices and deliveries from tool builders. The manufacture of guns of various types, on a large scale, is necessitating the production of a vast amount of gun making machinery. No large order of this kind has been placed since the recent Bethlehem Steel Co. purchase, but much more business is being set aside at Washington for various builders.

Miscellaneous inquiry for tools from commercial users continues. One of the largest inquiries now before the trade is another new list issued by the General Electric Co., Schenectady, N. Y., of general machine shop equipment, involving about 150 tools, including lathes, planers, milling machines, shapers, grinders and punches. The Ashcroft Mfg. Co., Bridgeport, Conn., has decided to cease making shrapnel fuses and has offered to other manufacturers of that city nearly $1,000,000 worth of munitions making machinery. In the event that it is not purchased locally, officials say that it will be offered elsewhere in America. The company is moving into its new building and will use the Kossuth street quarters for storage.

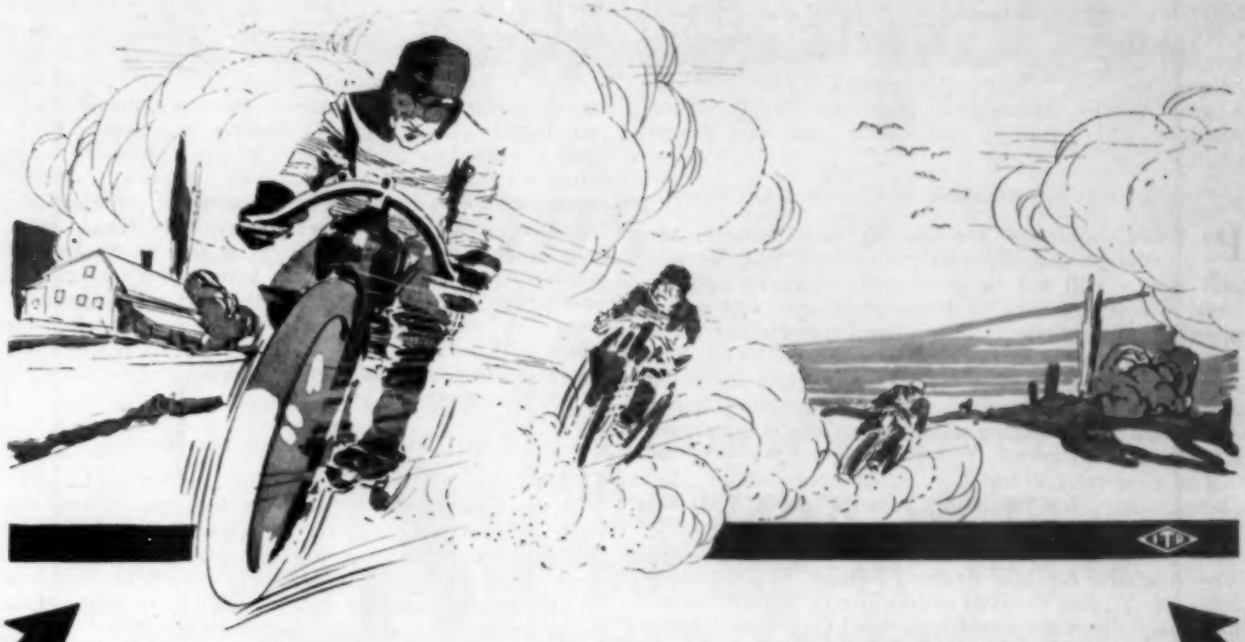
Crane builders have received many tentative inquiries for locomotive cranes from ship builders who are preparing estimates with a view to undertaking construction of wooden ships. As crane builders cannot promise delivery for six months or more, while yards are anxious to finish the first of these boats in about eight months, some little difficulty is being encountered. The Bethlehem Steel Co. recently closed for 24 cranes, of which the Pawling & Harnischfeger Co., Milwaukee, took 15, and the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., took nine. The Fore River Ship Building Corporation, Quincy, Mass., will require two 15-ton locomotive cranes for the construction of its new ship ways. The Turner Construction Co., Brooklyn, N. Y., has taken the general contract for a $1,000,000 erecting shop for the Brooklyn navy yard. The Emton Land Co. has been incorporated at Baltimore as the second step in the $50,000,000 steel and ship building enterprise which proposes to erect a plant opposite the ship building plant of the Bethlehem Steel Co. at Sparrows Point. The Baltimore Dry Dock & Ship Building Co.'s expansion plans are proceeding actively, but formal inquiry for equipment has not been issued as yet by the engineers, Day & Zimmerman, Philadelphia. The Newport News Ship Building Co., Newport News, Va., has not yet closed for the 10 cranes for which it recently inquired. Thomas J. Pope, 59 Pearl street, New York, is in the market for an 8-wheel locomotive crane, standard gage, with magnetic attachment.

Several leading builders of machine tools have just announced a further advance of 15 per cent in the price of power presses, over and above all other advances. Some builders refuse to accept further orders for milling machines at present, as the government's requirements have absorbed about all available tools. The demand for automatic screw machines has improved greatly. Several inquiries from aeroplane builders are pending and action is expected shortly.

Single Orders Feature Chicago Market

SOME uncertainty as to the government's requirements is affecting the machinery market. There have been some slack periods recently, but a fair general demand continues. The greater part of current business is for single tools rather than large lists. Chicago buyers took some of the equipment offered by the dismantling of the plant of the Reliance Engineering Co., Lansing, Mich., manufacturer of engines and pumps. The Moline Plow Co. has closed for about 20 tools for its drop forge shop, which is now being erected. Armour & Co. have canceled a number of tools ordered for its St. Paul plant. The Santa Fe railroad is about to place several tools inquired for a fortnight ago, and the Milwaukee railroad is understood to have completed its buying for the present.

The feature of the market is the increasing demand from new companies and extensions on the Pacific coast. The National Engineering & Equipment Co. will build a foundry at Seattle, the Auto Safety Brake Corporation will build a plant at Bellingham, Wash.; the Western States Machine Co. will build a plant for the manufacture of sugar mill machinery at Salt Lake City, the Savage Munitions Co. will build a plant at San Diego, the United Motors Corporation will build a plant at Los Angeles, Young & Tyler will



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From the selection of raw materials to the very last of the numerous processes necessary for attaining "Agathon" quality, we conduct exhaustive tests to make certain that a state of perfection will be reached.

SAFETY DEMANDS "AGATHON"—MAKE IT OF "AGATHON".

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Philadelphia Office: 902 Widener Bldg., - - - - - - - - Frank Wallace, District Representative
J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents.

build machinery plants at Los Angeles and Portland, Ore., is planning to equip a municipal machine shop. Eveleth and Thief River Falls, Minn., each asks figures on two waterworks pumps. The Watrous Engine Works, Minneapolis, and the Wahl Adding Machine Co., Chicago, will build new and larger plants.

Pittsburgh Plants to Work on Government Orders

PLANTS equipped for making munitions in the Pittsburgh district, which have been idle for several weeks, will not be dismantled. Federal officials have directed owners of these plants to keep equipment in running trim, to complete contracts for shells wanted by this country and our allies. The Erie Forge Co., Erie, Pa., has received a contract for shells and has just placed orders for 12 heavy-duty lathes. Additional shell making machinery will be purchased later by this concern.

The General Electric Co., Schenectady, N. Y., has placed orders for machinery, costing about $200,000, for its foundry and machine shop at Erie, Pa. A miscellaneous line of tools is included in this purchase. The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., has received orders for 12 electric traveling cranes from the Bethlehem Steel Co. The Liberty Steel Co., which has completed plans for a sheet mill at Warren, O., has placed contracts for considerable rolling mill equipment with the Hyde Park Foundry & Machine Co., Hyde Park, Pa. Details of this contract appear elsewhere in this issue of *The Iron Trade Review*.

Cleveland Buying Slows Up

SOME Cleveland machine tool dealers feel that the local tool market is far from normal. Few inquiries of note are before the trade and for the most part buying is slack. Last week one or two good-sized contracts for tools were consummated, one company closing for several heavy machines for installation in a local automobile plant. Another price advance has been made, planers having increased approximately 10 per cent. Milling machines, which until a week ago were always in great demand, have failed to revive so far this week. A few scattered inquiries on this type of equipment have come in, but far from equal the number of inquiries which have been made for such machines in the past. In the opinion of many local dealers prospective buyers are waiting for a decisive move on the part of the government. A sharp revival of buying is expected by many dealers as soon as a definite policy is disclosed by authorities in Washington with regard to machine tool requirements.

No Heavy Buying in Cincinnati

BUYING of machine tools in small lots features the Cincinnati market. No lists are before the trade. Several manufacturers have decided to withhold further contracting until the needs of the government have been more definitely decided. Builders of milling machines are further behind on orders than manufacturers of lathes, planers and drills. Plants making small electrical drills and grinders are well stocked with orders for foreign shipment. Heating and ventilating equipment will be purchased by the boards of education of St. Paris, O.; Canton, O.; Gary, Ind.; McCutchenville, O., and Purdue University, West LaFayette , Ind. The Ravenna Furnace & Heating Co., Ravenna, O., has increased its capital stock from $50,000 to $100,000, and will add to its manufacturing facilities. The Columbus Wire & Iron Works Co., Columbus, O., has increased its capital stock from $30,000 to $45,000.

New Construction and Equipment

What it is **Where it is** **Who's doing it**

Among New England Factories

STOCKTON SPRINGS, ME.—The Stockton Shipyard Co. which was recently incorporated by Lincoln A. Gardner, Herbert L. Hopkins and William H. Morrison will start up the old McGilvary yard which has been closed for 42 years.

CONCORD, N. H.—Holt Bros. have let the contract for a brick foundry building. The structure will be 1-story, 60 x 175 feet.

HENNIKER, N. H.—Fire in the K. & C. rim factory April 24 caused several thousand dollars damage to stock and machinery, forcing it to close pending repairs.

PORTSMOUTH, N. H.—Plans are being prepared for a brick, fireproof, 2-story, 50 x 350-foot hotel of 125 rooms for the New Appledore Co. on Appledore island.

AUBURN, MASS.—Bids have closed for a brick and reinforced concrete, 50 x 160-foot addition to the plant of the Worcester Rendering Works.

BOSTON.—The Coto-Coil Co. has been incorporated with $100,000 capital by R. A. Leeson, F. H. Bishop and Woodward Emery.

BOSTON.—John L. Whiting has let a contract to William M. Bailey for a reinforced concrete, 2-story and basement, 55 x 60-foot manufacturing building.

BOSTON.—T. Levine & Son have been incorporated to do sheet metal work with $10,000 capital by Benjamin Levine, Thomas Levine and E. H. Levine.

BOSTON.—The Green Instrument Co. has been incorporated with $50,000 capital by William Powers, Joseph Green and James Campbell.

BOSTON. — The Dexter Mfg. & Rubber Co. has been incorporated with $220,000 capital by Alvin S. Dexter, Brookline, and James C. Sears, of Somerville, Mass.

BOSTON.—The city will build a high-pressure station, 1-story, 54 x 90 feet. Edward F. McSweeney, 40 Central street, is in charge.

BOSTON, MASS.—Bids have closed for a reinforced concrete, fireproof, 9-story, 80 x 197-foot engine house and warehouse for the United Fruit Co., Revere Sugar Refining Co., lessee, on Mystic river, Charlestown, Mass.

CAMBRIDGE, MASS.—Blanchard Machine Co. has let the general contract for a 2-story machine shop, 60 x 90 feet, to the William Bailey Co., 88 Broad street.

CHICOPEE, MASS. — The Turners Falls Power & Electric Co., Turners Falls, Mass., has purchased 38 acres of property and will erect a power plant to cost between $1,000,000 and $1,500,000.

FITCHBURG, MASS.—The Simonds File Co. has let the contract for a brick, 1-story, 102 x 62-foot factory building on Falalah road.

MALDEN, MASS. — Eastern Smelting & Refining Co., care of Malden board of trade, has plans for a $100,000 plant.

NEW BEDFORD, MASS. — The Penrod Mills has let a contract to F. Hill Smith, New York, for a brick and steel, mill construction, 3-story, 125 x 500-foot mill.

SOMERVILLE, MASS.—Whittemore Wood-

GET THIS

Looking over the boys we're putting in the Big Quarrel makes me think of the Hubbard and their rolls.

We won't furnish all of the fighters, but by George, we'll furnish the best of them.

So long—

Rolling Mill Jim.

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

bury Co. will erect a 1-story plant, 60 x 100 feet.

STURBRIDGE, MASS. — The Snell Mfg. Co. has let the contract for a reinforced concrete, 1-story, 40 x 180-foot forge room to replace the one recently destroyed by fire.

WORCESTER, MASS. — Fire and water damaged the plant of the R. B. Phillips Mfg. Co., April 29, to the extent of $10,000.

WORCESTER, MASS.—The Wells Chemical Bronze Co. has let a contract for a brick, 1-story, 15 x 39-foot addition to its plant.

PAWTUCKET, R. I.—The C. S. Skinner Co. will build a 4-story, 125 x 250-foot building, to cost $100,000.

PROVIDENCE, R. I.—The Butler Exchange Co. has let a contract for a brick, 2-story, 30 x 80-foot addition to the Andrews building.

PROVIDENCE, R. I.—George W. Dover has been incorporated to make machinery with $20,000 capital by George William Dover, Benjamin Peckham and Frederick H. Brotesman.

PROVIDENCE, R. I.—The Roger Williams Corp. has been incorporated with $100,000 capital by Charles R. Easton, John H. McGough and John J. Rosenfield to erect a hotel to be known as the Roger Williams.

WOONSOCKET, R. I.—The Woonsocket Napping Machinery Co. has let a contract for a 1-story, 40 x 80-foot addition to its plant, to be used for a machine shop.

BRIDGEPORT, CONN.—C. D. Davis will build a brick and stone, 5-story, 60 x 124-foot building, to cost $200,000.

BRIDGEPORT, CONN. — The Bridgeport Metallic Works has been incorporated with $150,000 capital by William V. Thompson, William R. Renesch and M. G. Hubbard.

BRIDGEPORT, CONN.—The Bullard Machine Tool Co. has acquired the foundry of the Gray Iron Casting Co. and the Taylor Foundry Co. at Black rock which includes nine acres of land, formerly known as the Fairfield Acid Works, upon which to build.

EAST HARTFORD, CONN.—The plant of the Cairns Woodworking Co. was damaged by fire April 26, with a $50,000 loss.

HARTFORD, CONN.—The city will build a brick and steel, fireproof, 4-story and basement, 80 x 125 x 130-foot fire headquarters building to cost $100,000, on Pearl street.

MIDDLETOWN, CONN.—The Middlesex Machine Co. has been incorporated with $15,000 capital by Oscar Nilson, Ernest A. Inglis and Frederick A. Brassill.

NEW HAVEN, CONN.—Yale University will install a central power station and heating plant. French & Hubbard, 88 Pearl street, Boston, are the engineers.

NEW HAVEN, CONN.—The H. & T. McCluskey & Sons Co. has been incorporated to make wire goods with $10,000 capital by Henry McCluskey, Thomas McCluskey, Henry E. McCluskey and Ralph K. McCluskey.

Along the Middle Atlantic Seaboard

ALBANY, N. Y.—Patten Vulcanizing Co. will build a 1-story plant, 100 x 200 feet, to cost $40,000.

BROOKLYN.—Ralph Leoninger, 1044 Park Row, has plans for an 8-story plant, 90 x 160 feet, to cost $180,000.

BUFFALO.—Farrar & Trefts, Inc., Perry and Illinois streets, will erect a 1-story foundry, 120 x 345 feet.

BUFFALO.—The Lehigh Valley railroad has obtained a permit to erect a $200,000 engine house.

BUFFALO.—Aluminum Castings Co., Cleveland, will build a 1-story foundry, 130 x 260 feet, on Elmwood avenue.

BUFFALO.—The Reliance Air Brake Co. has been incorporated with $200,000 capital to manufacture brake appliances, railway supplies, etc., by F. H. Dukesmith, F. C. Norton, W. F. Schwartz.

EDDYVILLE, N. Y.—The Dempsey Oil Engine Corporation has been incorporated with $500,000 capital; by A. W. Britton, S. B. Howard and L. H. Gunther.

ELMIRA, N. Y.—Elmira Foundry Co. will build a plant, 1-story, 90 x 300 feet.

ESOPUS, N. Y.—The Donning Carbureter Corporation, capital $300,000, will manufacture carbureters and engines. The incorporators are: R. Grant, G. W. Donning and A. K. Barker.

GOWANDA, N. Y.—The Star Iron Works Co. has been incorporated with $75,000 capital to manufacture iron and steel products. W. W. Watson, C. E. Gauschwind and D. H. Foster are the incorporators.

LAUREL HILL, L. I., N. Y.—Nichols Copper Co. will build a boiler house, 2-story, 50 x 75 feet, to cost $60,000.

MANHATTAN, N. Y.—The Wager Bridge Wall Co., capital $25,000, will manufacture furnace bridge walls. The incorporators are: E. R. Mead, H. C. Hunter and G. W. Williamson Jr.

NEW YORK.—The Downey Ship Building Corporation has increased its capital to $10,000,000; former capital, $5,000,000.

NEW YORK.—The engineering department of Dodwell & Co., 30 Broad street, is in the market for two 10-ton, 2-speed, electric capstant without motors.

NEW YORK. — The Mulford-Haas Co., Brooklyn, has been incorporated with $100,000 capital to manufacture motors, engines, cars, flying machines, etc., by C. A. Wood. H. Van Alst, J. Lonardo, Flushing.

NIAGARA FALLS, N. Y.—A general contract for a plant to be 1-story, 60 x 120 feet and to cost $30,000 for the Isco Chemical Co. has been let to J. W. Cowper Co., Fidelity building, New York.

POUGHKEEPSIE, N. Y. — The Century Steel Co., formerly of Brooklyn, will erect a new plant.

SYRACUSE, N. Y.—The Syracuse Alloy Steel Co., capital $25,000, has been incorporated by F. C. Raab, C. A. Lawton and M. C. Warwick. The company will manufacture machinery, tools and castings.

CONSHOHOCKEN, PA.—Hale Fire Pump Co., Wayne, Pa., has let a contract for the erection of a 1-story structure, 40 x 96 feet. The company intends to remove its entire plant to Conshohocken.

MEADVILLE, PA.—The Meadville Metal Products Co. has been incorporated by M. L. Smith, C. N. Crosby and C. E. Baldwin. Capital $25,000.

NORTH WALES, PA.—Estimates are being taken on the construction of a 1-story, 67 x 72-foot addition for the Montgomery Mills Company.

PHILADELPHIA. — American Metal Works will take bids shortly on revised plans for a 2-story nickel plating shop, 60 x 320 feet.

PHILADELPHIA. — Westmoreland Chemical Co. will build a plant addition, 2-story, to cost $16,000. Milton Birch, Twenty-second and Westmoreland streets, is taking bids.

PHILADELPHIA. — Electric Storage Battery Co. will build a power house, 1-story, 40 x 80 feet, to cost $50,000. David Pepper, Room 1516, 1201 Chestnut street, is the engineer.

PITTSBURGH.—The capital of the Lava Crucible Co. has been increased from $100,000 to $500,000.

PITTSBURGH. — The Standard Machine Co., capital $50,000, has been incorporated by W. C. Kenny and M. F. Christian. The company will operate machine shops.

PITTSBURGH. — The Ladd Water Tube Boiler Co., capital $50,000, has been incorporated recently by M. A. Gillespie, R. W. Gibbs and E. A. McGowan.

PITTSBURGH, PA.—The Ohio City Gas Co. has purchased a tract near Belle upon which it will begin immediately the construction of a salt making plant. $1,000,000 is to be invested.

POTTSTOWN, PA. — The Steel Plates Products Co. recently has been incorporated for $50,000 by John B. Evans, Jesse R. Evans and E. B. Hatfield. S. Rea Morris is treasurer.

WAYNESBORO, PA.—H. T. Shearer Machine Co. will build a 1-story plant, to be 44 x 108 feet.

ELIZABETH, N. J.—The Singer Mfg. Co. has been granted a permit for a foundry building, 200 x 200 feet, to cost $35,000.

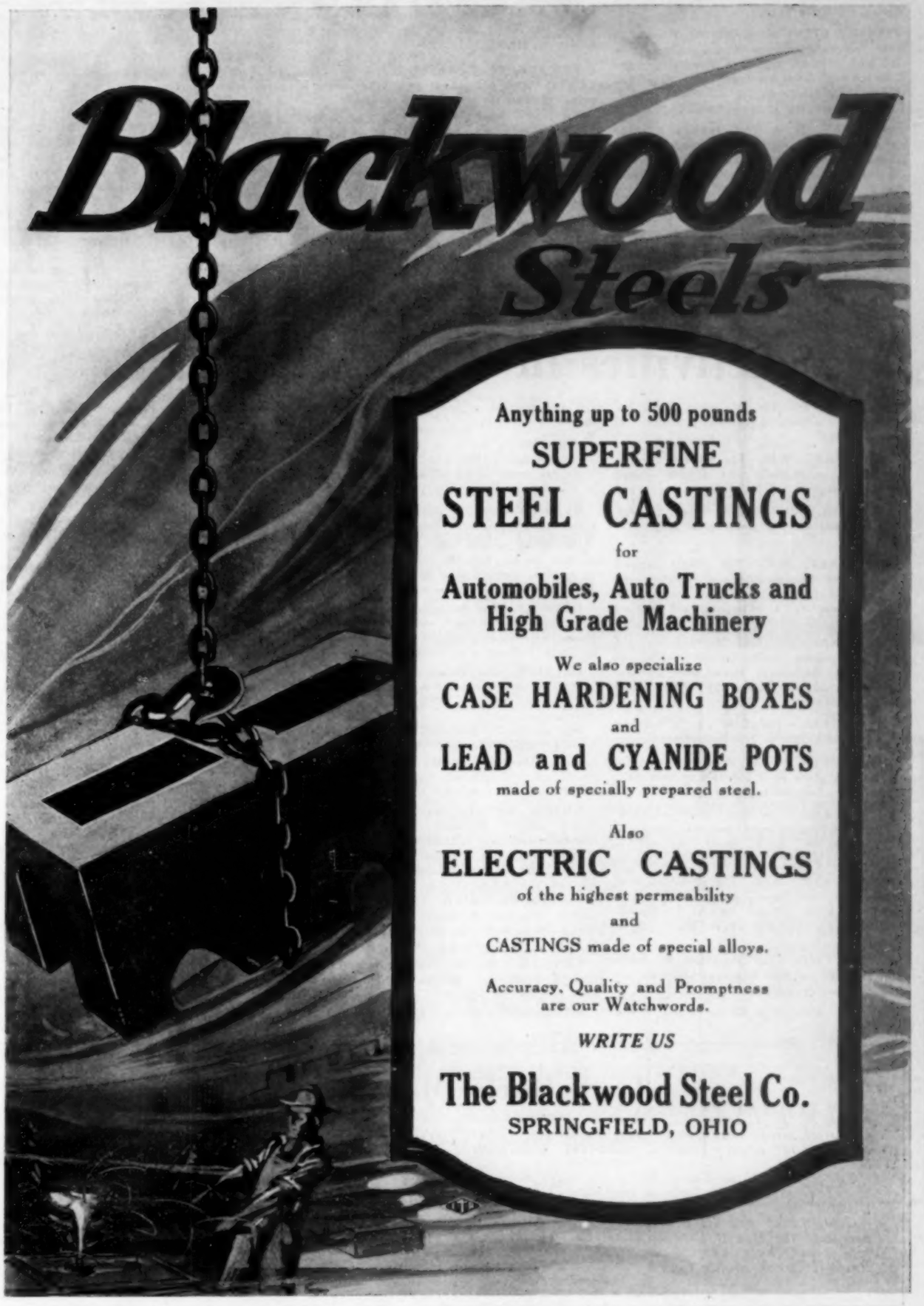
JERSEY CITY, N. J. — Patterson Allen Engineering Co. will build a 1-story machine

Government Inquiries

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., is in the market for the following machine tools:

Eight portable breast drills, 2 speeds, 1058, May 15, Bridgeport, Conn.
Eight portable electric drills, 1058, May 15, Bridgeport, Conn.
One radial drill, 1083, no date, Mare Island, Cal.
Eight portable grinders, double emery, 1058, May 15, Bridgeport, Conn.
Four bench lathes, 1061, no date, Washington, D. C.
One 32-inch horizontal boring, drilling and milling machine, 1057, Boston, Mass.
Two high-duty drilling machines, 1061, no date, Washington, D. C.
One self-contained engraving machine, 1065, May 22, Mare Island, Cal.
Two polishing and finishing machines, 1061, no date, Washington, D. C.
Nine automatic screw machines, 1061, no date, Washington, D. C.
Two screw machines with wire feed and tube and finger feed, No. 1, 1061, no date, Washington, D. C.
One No. 1 screw machine, wire feed, 1061, no date, Washington, D. C.
One 48 x 48 x 36-foot planer, 1060, no date, Washington, D. C.
One 300-ton high-speed forging press, 1092, no date, Norfolk, Va.
Two plate spacing tables, motor-driven with punches, 1091, no date, Philadelphia and Norfolk, Va.

Schedule numbers, dates of opening of bids and place of delivery follow the specifications of the tools.



Say you saw it in THE IRON TRADE REVIEW

shop, 50 x 200 feet. President is W. G. Wilson, Westside avenue.

JERSEY CITY, N. J.—Morris Process of New Jersey, Incorporated, has been organized with $150,000 capital to manufacture and deal in engines and power distributing machinery. C. H. Jarvis, P. L. Nieser and J. L. Turner are the incorporators.

KEARNEY, N. J.—An explosion followed by fire seriously damaged the coal tar by-products plant of the Seaboard By Products Co. and practically destroyed the machine shops, blacksmith shops and laboratory.

NEWARK, N. J.—Joseph C. Kuehue, 814 South Eighteenth street, will build a machine shop, 1-story, 22 x 100 feet.

NEWARK, N. J.—Pittsburgh Plate Glass Co. will build a 1-story plant, 200 x 225 feet. General contract has been awarded Levering & Garrigues, New York.

NEWARK, N. J.—The boiler and power house of the Hewitt Steel Corporation recently was badly damaged by fire, incurring a loss of $10,000.

NEWARK, N. J.—The Heller Bros. Tool Co. has been granted a permit to erect a plant addition to cost about $18,000. The structure will be 2-story, 40 x 85 feet.

NEWARK, N. J.—The Aluminum Goods Mfg. Co. has taken out a permit to erect a 6-story, reinforced concrete factory and storage building. The building will occupy a space 105 x 270 feet and will cost $310,000.

NEWARK. — The Block Chemical Works has been incorporated with a capital of $50,000 to manufacture chemicals, by Alexander Block, Max C. Block, Simon Abrahamson, Brooklyn, and Samuel Block, East Orange.

TRENTON, N. J.—Geo. F. Eberhard, manager of the Trenton Ingersoll Watch Co. announces that the company will soon erect an addition which will double its capacity.

VINELAND, N. J.—The Gage Tool Co. has been incorporated with $50,000 capital to manufacture machine tools; by E. P. Bacon, A. M. Pierson and H. G. Walls.

WILMINGTON, DEL. — The Bessemer Motor Truck Co., capital $2,000,000, has been incorporated and will manufacture motor vehicles of all kinds. The incorporators are: M. V. Haywood and Clement M. Egner.

BALTIMORE.—The Baltimore Tube Co. will erect a machine shop addition 1-story, 62 x 141 feet, to cost $10,000.

BALTIMORE.—L. Gordon & Son are having plans drawn by Lewis Levi, Philadelphia, for a manufacturing building to be erected at 220-224 North Front street.

Activities in the Central States

BELOIT, WIS.—The Wisconsin Farm Implement Co. is building a foundry addition 40 x 75 feet.

GREEN BAY, WIS.—The Lawson Aircraft Co., newly incorporated with $10,000 capital, will build a plant. J. P. Jenson is manager.

KENOSHA, WIS. — The Cooper Underwear Co. will build a power plant and boiler house.

KEWAUNEE, WIS.—The Storic Engine Co. has been incorporated with $50,000 capital to build internal combustion engines by O. O. Storie, O. L. Pierpont, and Wenzel Heck.

KIEL, WIS.—The Kiel Machine Co. has been incorporated with $12,000 capital to manufacture machinery, steam and gas engines, with $12,000 capital by Gottlieb and Edward Burkhardt.

MILWAUKEE.—The Falk Co. is building a machine shop 184 x 275 feet.

MILWAUKEE. — The Roberts Brass Co. will build a plant 40 x 100 feet to cost $15,000. R. C. Zannoth is secretary.

MILWAUKEE.—The city plans a 1,550-foot viaduct of reinforced concrete and steel, to cost $400,000. C. E. Malig, city hall, is architect.

MILWAUKEE, WIS.—The Modern Steel Casting Co. has been incorporated with a capital stock of $25,000 by A. J. Deuser, William T. Hardy and Fred W. Biehm, all of Milwaukee.

RACINE, WIS.—The Hamilton & Beach Mfg. Co. has awarded a general contract for a $25,000 factory addition.

RACINE, WIS.—The Racine Motor Truck Co. will establish a plant to build and repair motors.

WONEWOC, WIS.—A. P. Gale, proprietor of the Wonewoc Mill Co., is planning to rebuild his water power electric plant in order to double its capacity for public service.

DETROIT.—The Detroit Tire Carrier Co. soon will erect several new buildings.

DETROIT. — The F. A. Chappen Iron Works, capital $100,000, has been organized to manufacture and deal in metals by F. A., F. E., and Alvine Chappen.

DETROIT.—The Central Machine Co. has been incorporated with $15,000 capital, by Frank A. Schaum, George B. Bright, Charles A. Dean Jr., and Charles A. Dean Sr.

DETROIT.—The Caughey Construction Co., capital $25,000, has been organized by Joseph A. Jossman, William R. Jossman and Frank T. Caughey.

DETROIT.—A $200,000 contract for the heating, ventilation and power plant apparatus for the public library has been awarded to the L. H. Prentice Co., Chicago. L. H. Prentice, Waukegan, Ill., is president.

GRAND RAPIDS, MICH. — The Grand Rapids Textile Machinery Co., J. Shields, manager, will build a foundry 80 x 100 feet.

INKSTER, MICH.—The Wolverine Car & Tractor Co. has bought a site and will build a plant.

ISHPEMING, MICH. — The Marquette County Electric Railway Co. recently has been incorporated with $25,000 capital, by R. W. Waite, A. Hardgrave and L. N. Boissen.

LANSING, MICH.—The Brownwall Engine & Pulley Co. has increased its capital from $50,000 to $100,000.

MUSKEGON, MICH.—The Grand Rapids Universal Valveless Four-cycle Motor Co. has changed its name to the Muskegon Engine Co. and will erect a plant at Muskegon. C. E. Johnson is president and general manager.

SAGINAW, MICH.—The Studebaker Corporation plans to erect an assembling plant.

CHICAGO. — The Illinois Malleable Iron Co., H. E. Bullock, president, will build a foundry addition 154 x 325 feet, to cost $40,000.

CHICAGO. — The Wahl Adding Machine Co. will build a 3-story factory, 124 x 168 feet, to cost $95,000. S. C. Roberts is president.

CHICAGO.—The Wright Motor Co. has been incorporated with $500,000 capital to manufacture engines by Charles T. Cabrera, D. Rose and Albert Scheible.

CHICAGO.—The sanitary district of Chicago will proceed to build bridges over the drainage canal at Cicero, Crawford and Harlem avenues.

ROCKFORD, ILL.—The Forest City Bit & Tool Co. will increase its capital stock from $25,000 to $100,000.

ANDERSON, IND.—The Swayne-Robinson Co. will erect an addition to its plant, 60 x 180 feet.

ANDERSON, IND. — The Reynolds Gas Regulator Co. has been incorporated with a capital of $60,000. Miron G. Reynolds, Jacob C. Groble and C. B. Reynolds, are the directors.

LOGANSPORT, IND.—The Revere Motor Co. will construct a plant having a floor space of 33,000 square feet. Excavation work has been started.

SOUTH BEND, IND. — The Studebaker Corporation is preparing plans for a 1-story machine shop, 628 x 1,000 feet.

Trade Circles Moving Fastly

The M. E. Lasarus Co., Cleveland, dealer in iron and steel scrap, has moved from 976-978 Rockefeller building, to larger quarters, 1242-1244 Rockefeller building.

The offices of the Ghent Motor Co. have been removed from 20 East Jackson boulevard, Chicago, to Ottawa, Ill.

C. J. Franz and R. G. Holbrook, who have been operating the Hewitt Bearing Metal Co. for the past few years, have adopted the trade name of the Franz-Holbrook Bronze Co.

A change in management and the removal of its main office to Elyria, O., is announced by the Duplex Mfg. & Foundry Co.

The Thames Shipyard, New London, Conn., is constructing for the New London Ship & Engine Co. a floating machine shop, 30 x 130 feet. When completed, the float will be towed to Provincetown, Mass., anchored in the harbor, and used as a tender for submarines undergoing trial tests.

Iron Ore

from our Open Pit Mines

PHYSICAL STRUCTURE
COARSE

HIGH IN MANGANESE

VERY DESIRABLE FOR
MAKING BASIC IRON

Some furnace managers are continually finding themselves in trouble. Others seem to get by, year after year, with hardly a worry. ¶You will find that the use of our

CRAWFORD ORE
Mesaba Non-Bessemer

will keep you free from furnace mixture troubles.

The Tod-Stambaugh Company
Perry-Payne Building
CLEVELAND - - - OHIO

Perhaps you have often wondered why it is that many of your competitors can go along day after day, always escaping pig iron troubles.

But a little investigation on your part will show you that these competitors are very strict concerning the iron ores that they use.

Our record for *quality* and *square dealing* dates back many years.

If you place your confidence in us you will not be disappointed.

Iron and Steel Prices

Corrected up to Tuesday noon

IRON ORE

Lake Superior Ores. Lower Lake Ports.

Old range Bessemer, 55 per cent, ton	5.95
Mesabi Bessemer, 55 per cent, ton	5.70
Old range non-Bess., 51½ per cent, ton	5.20
Mesabi non-Bess., 51½ per cent, ton	5.05

Port Henry Ores. Per unit delivered eastern Pa. All non-Bessemer.

Old Bed, crude, 58 per cent	10.50c to 11.00c
Old Bed, concent., 65 per cent	11.00c to 11.50c
Harmony concent., 63 per cent	11.50c to 11.75c
Lump (at mines)	$5.75

WAREHOUSE PRICES

Steel bars, Chicago	4.50c
Steel bars, Cleveland	4.50c
Steel bars, Detroit	4.25c
Steel bars, Philadelphia	5.00c
Steel bars, New York	4.50c
Steel bars, St. Louis	4.30c to 4.50c
Steel bars, Cincinnati	4.65c
Steel bars, St. Paul	4.60c
Steel bars, over 2-in., Buffalo	4.50c
Steel bars, Buffalo	4.40c
Iron bars, Chicago	4.50c
Iron bars, Cleveland	4.50c
Iron bars, Detroit	4.00c
Iron bars, St. Louis	4.25c to 4.40c
Iron bars, Cincinnati	4.65c
Iron bars, Philadelphia	4.50c
Iron bars, New York	4.00c to 4.25c
Shapes, Chicago	5.00c
Shapes, Detroit	4.50c
Shapes, St. Louis	5.05c
Shapes, St. Paul	5.10c
Shapes, New York	4.75c
Shapes, Cleveland	5.00c
Shapes, Philadelphia	4.75c to 5.00c
Shapes, Buffalo	4.60c
Shapes, Cincinnati	5.00c
Plates, Chicago	6.50c
Plates, Detroit	5.50c
Plates, St. Louis	6.55c
Plates, St. Paul	6.60c
Plates, New York	6.50c to 7.00c
Plates, Cleveland	6.50c to 7.00c
Plates, Philadelphia	7.00c
Plates, Cincinnati	7.00c
No. 10 blue anl. sheets, Chicago	7.00c
No. 10 blue anl. sheets, Clevel'd	7.00c
No. 10 blue anl. sheets, Buffalo	4.50c
No. 10 blue anl. sheets, St. L.	7.05c
No. 10 blue anl. sheets, Cincin.	7.00c
No. 10 blue anl. sheets, St. Paul	7.10c
No. 10 blue anl. sheets, Detroit	5.75c
No. 28 black sheets, Chicago	7.50c
No. 28 black sheets, Cleveland	7.75c
No. 28 black sheets, Cincinnati	7.00c
No. 28 black sheets Detroit	5.90c
No. 28 black sheets, St. Louis	7.55c
No. 28 black sheets, St. Paul	7.60c
No. 28 galv. sheets, Chicago	9.00c
No. 28 galv. sheets, Cleveland	9.00c
No. 28 galv. sheets, Cincinnati	8.50c
No. 28 galv. sheets, Detroit	8.00c
No. 28 galv. sheets, St. Louis	8.85c
Hoops, Cleveland	5.50c
Hoops, Detroit	4.75c

IRON AND STEEL SCRAP

STEEL WORKS USE

(Gross Tons)

Bundled sheets, Pittsburgh	$18.50 to 19.00
Bundled sheets, Cleveland	17.00 to 17.50
Bundled sheets, Buffalo	16.00 to 16.50
Frogs, switches, guards, St. L.	27.50 to 28.00
Heavy melting steel, Pittsburgh	27.50 to 28.00
Heavy melting steel, Buffalo	27.00 to 28.00
Heavy melting steel, Chicago	27.50 to 28.00
Heavy melting steel, Cleveland	27.50
Heavy melting steel, Cincinnati	24.50 to 25.50
Heavy melting steel, eastern Pa.	24.50 to 25.50
Heavy melting steel, New York	22.00 to 23.00
Heavy melting steel, St. L.	28.00 to 29.00
Heavy melt'g steel, Birmingham	20.50 to 21.50
Hydraulic pressed sheets, Cleve.	21.00 to 21.50
Hydraulic pressed sheets, Pitts.	21.50 to 22.50
Hydraulic pressed sheets, Chgo.	20.00 to 20.50
Low phos. steel, Buffalo	36.00 to 38.00
Low phos. steel, Pittsburgh	36.00 to 37.00
Low phos. steel, eastern Pa.	36.00 to 38.00
Shoveling steel, Chgo.	24.00 to 25.00
Shoveling steel, St. Louis	24.00 to 24.50
Steel rails, short, Chicago	31.50 to 32.00
Steel rails, short, Cleveland	32.00 to 32.50
Steel rails, short, St. Louis	29.50 to 30.00
Steel rails, old, Birmingham	22.50 to 23.50
Stove plate, Cleveland	16.00 to 16.50
Stove plate, Cincinnati	14.25 to 14.75
Stove plate, St. Louis	14.00 to 14.50
Stove plate, N. J. points	16.00 to 16.50
Stove plate, Birmingham	13.50 to 14.50
Stove plate, Buffalo	17.00 to 17.50
Stove plate, eastern Pa.	19.00 to 19.50
Stove plate, Pittsburgh	16.00 to 17.00

(Net Tons)

Boiler plate, cut, No. 1, Chicago	18.00 to 18.50
Boiler plate, cut, No. 1, St. L.	17.00 to 17.50
Bundled sheet, Cincinnati	15.25 to 15.75
Knuckles, coup., Chicago	30.50 to 31.00
Knuckles, coup., St. Louis	28.00 to 28.50
Springs, Chicago	30.75 to 31.25
Stove plate, Chicago	14.25 to 14.75

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (r. and w.)	4.25
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
St. Louis	3.40
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54
Duluth, Minn., to:—	
Minneapolis-St. Paul	$1.25
Mayville, Wis:—	
Minneapolis-St. Paul	$1.75

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.0 cents

IRON MILL USE

(Gross Tons)

Busheling No. 1, Buffalo	23.00 to 23.50
Busheling, No. 2, Buffalo	14.00 to 14.50
Busheling, No. 1, Pittsburgh	20.00 to 21.00
Cast borings, New York	13.50 to 13.75
Cast borings, eastern Pa.	15.50 to 16.50
Cast borings, Buffalo	13.00 to 13.50
Cast borings, Pittsburgh	15.25 to 15.75
City wrought, New York	26.00 to 26.50
Cut forge, Chicago	27.75 to 28.25
Forge flash'gs, un. 10 in., Cleve.	22.50
Forge flash'gs, ov. 10 in., Cleve.	20.00 to 21.00
Forge, No. 1, eastern Pa.	18.50 to 19.00
Grate bars, Buffalo	17.00 to 17.50
Grate bars, N. J. points	16.00 to 16.50
Iron axles, Pittsburgh	49.00 to 50.00
Iron axles, Cincinnati	44.00 to 45.00
Iron axles, eastern Pa.	38.00 to 40.00
Iron axles, Buffalo	45.00
Iron rails, Chicago	33.00 to 33.50
Iron rails, Buffalo	27.00 to 27.50
Iron rails, Cincinnati	28.00 to 29.00
Iron rails, St. Louis	32.50 to 33.00
Iron rails, Cleveland	32.00 to 33.00
Machine shop turnings, Buffalo	13.00 to 13.50
Mch. shop turnings, New York	12.00 to 12.50
Mach. shop turnings, Pittsburgh	13.75 to 14.25
Mch. shop turnings, eastern Pa.	14.50 to 15.00
Mch. shop turnings, Birmingham	8.50 to 9.50
R. R. and mch. cast, No. 1, Bfl.	26.00 to 26.50
R. R. wrought, No. 1, Buffalo	35.00 to 36.00
R. R. wrgt., No. 1, eastern Pa.	39.00 to 41.00
R. R. wrought, No. 1, Pittsburgh	30.00 to 31.00
R. R. wrought, No. 1, B'ham	25.00 to 25.50
Wrought pipe, Buffalo	17.00 to 17.50
Wrought pipe, eastern Pa.	21.50 to 22.50
Wrought pipe, New York	18.50 to 19.00

(Net Tons)

Angle bars, iron, Chicago	$33.50 to 34.00
Angle bars, steel, St. Louis	25.50 to 26.00
Arch bars and transoms, St. L.	31.50 to 32.00
Arch bars and transoms, Chgo.	35.00 to 35.50
Busheling, No. 1, Chicago	19.50 to 20.50
Busheling, No. 1, Cincinnati	16.50 to 17.00
Busheling, No. 1, Cleveland	20.00 to 20.50
Busheling, No. 1, St. Louis	19.50 to 20.00
Busheling, No. 2, Chicago	14.00 to 14.50
Cast borings, Cincinnati	10.00 to 10.50
Cast borings, Cleveland	12.00 to 12.25
Cast borings, St. Louis	12.00 to 12.50
Cast borings, Chicago	10.75 to 11.25
Grate bars, Cleveland	16.00 to 16.50
Iron axles, St. Louis	41.50 to 42.00
Iron axles, Chicago	42.50 to 43.00
Iron axles, Cleveland	45.00 to 46.00
Machine shop turnings, Chicago	11.00 to 11.50
Mach. shop turnings, Cleveland	11.00 to 11.25
Machine shop turn'gs, Cincinnati	10.00 to 10.50
Mach. shap turnings, St. Louis	12.50 to 13.00
Pipes and flues, Cleveland	19.00 to 20.00
Pipes and flues, Chicago	17.50 to 18.00
Pipe sand flues, St. Louis	18.50 to 19.00
Railroad wrought, No. 1, Cleve.	30.00 to 31.00
Railroad wrought, No. 1, Chgo.	31.00 to 31.50
Railroad wrought, No. 1, Cinci.	23.50 to 24.50
Railroad wrought, No. 1, St. L.	30.00 to 30.50
Railroad wrought, No. 2, Chgo.	28.00 to 28.50
Railroad wrought, No. 2, St. L.	27.50 to 28.00

IRON OR STEEL WORKS USE

(Gross Tons)

Axle turnings, Cleveland	$17.50 to 18.00
Axle turnings, Buffalo	18.50 to 19.00
Shafting, New York	28.50 to 29.00
Shafting, eastern Pa.	34.00 to 35.00
Steel car axles Birmingham	35.00 to 36.00
Steel car axles, New York	42.00 to 43.00
Steel car axles, Buffalo	45.00
Steel car axles, Cleveland	44.00 to 45.00
Steel car axles, Pittsburgh	49.00 to 50.00
Steel car axles, eastern Pa.	41.00 to 43.00

(Net Tons)

Shafting, St. Louis	28.00 to 28.50
Steel car axles, St. Louis	42.00 to 43.00
Steel car axles, Chicago	43.00 to 44.00

IRON FOUNDRY USE

(Gross Tons)

Car wheels, (iron), Pittsburgh	24.00 to 25.00
Car wheels, (steel), Pittsburgh	29.00 to 30.00
Car wheels, Chicago	24.50 to 25.00
Car wheels, eastern Pa.	27.00 to 28.00
Car wheels, Buffalo	26.50 to 27.00
Car wheels, New York	21.50 to 22.50
Car wheels, St. Louis	24.00 to 24.50
Car wheels, Birmingham	18.00 to 19.00
Car wheels, Cleveland	23.00 to 24.00
Cast, No. 1, N. J. points	25.00 to 25.50
Cast, No. 1, eastern Pa.	28.00 to 29.00
Cast, No. 1, Pittsburgh	23.50 to 24.00
Cast, No. 1, Birmingham	21.00 to 21.50
Malleable railroad, Cincinnati	16.00 to 16.50
Malleable railroad, Cleveland	24.00 to 25.00
Malleable railroad, Buffalo	25.00 to 25.50
Malleable railroad, Pittsburgh	22.00 to 22.50
Malleable railroad, eastern Pa.	25.00 to 26.00
Tram car wheels, Birmingham	20.50 to 21.50

(Net Tons)

Cast, No. 1, Chicago	21.50 to 22.00
Cast, No. 1, Cincinnati	21.25 to 21.75
Cast, No. 1, St. Louis	20.00 to 20.50
Malleable railroad, Chicago	22.50 to 23.00
Malleable railroad, St. Louis	20.50 to 21.00
Malleable agricultural, Chicago	17.50 to 18.00
Malleable railroad, St. Louis	20.50 to 21.00

MISCELLANEOUS USES

(Gross Tons)

Reroll. rails, 5 ft. & ov., Pitts.	32.00 to 35.00
Reroll. rails, 5 ft. & ov., Chgo.	34.50 to 35.50
Reroll. rails, 5 ft. & ov., E. Pa.	32.00 to 33.00
Reroll. rails, 5 ft. & ov., St. L.	33.50 to 34.00
Reroll. rails, 5 ft. or ov., Cleve.	33.00 to 34.00
Reroll. rails, 5 ft. or ov., Birm.	30.00 to 31.00

(Net Tons)

Boiler punchings, Chicago	24.50 to 25.00
Locomotive tires, Chicago	41.00 to 41.50
Locomotive tires, St. Louis	37.00 to 39.00